Representative Fonn. How long after the President was brought in before you went to trauma room No. 1?

Dr. Perry. That I don't know either. My last recollection in regard to time was approximately 12:30 when I was having lunch prior to rounds, and Dr. Jones picked up the page and as we went downstairs I took off my watch and dropped it in my coat pocket, rather expecting to do some kind of procedure, and I took off my coat and I never looked at the clock until afterwards.

Mr. McCloy. One more question, I want to get clear.

The extent to which you examined Governor Connally’s wounds, as I gather, you were asked to stand by.

Dr. Perry. That is right, sir.

Mr. McCloy. Rather than to be involved in a close examination of the wounds. Dr. Perry. That is right, sir.

Mr. McCloy. So you are not generally familiar?

Dr. Perry. No, sir; all I did was come into the operating room, put on a scrub suit, cap and mask, and looked at the thigh wound before Dr. Shires started the operation. That was the extent of the episode into the wound, and I stayed there while he carried it down to the lower portion of the wound and indicated there was no serious injury, and I left the operating room at that point.

Mr. McCloy. And you didn’t see the other two wounds?

Dr. Perry. I didn’t see the other wounds at all, sir.

Representative Fonn. Thank you very much, Dr. Perry.

Your testimony has been most helpful.

(Whereupon, at 11:45 a.m., the President’s Commission recessed.)

Tuesday, March 31, 1964

TESTIMONY OF ROBERT A. FRAZIER AND RONALD SIMMONS

The President’s Commission met at 9 a.m. on March 31, 1964, at 200 Maryland Avenue NE, Washington, D.C.

Present were Chief Justice Earl Warren, Chairman; Representative Hale Boggs and John J. McCloy, members.

Also present were J. Lee Rankin, general counsel; Melvin Aron Eisenberg, assistant counsel; Norman Redlich, assistant counsel; Charles Murray and Lewis Powell, observers; and Leon Jaworski, special counsel to the attorney general of Texas.

TESTIMONY OF ROBERT A. FRAZIER

The Chairman. Mr. Frazier, the purpose of today's hearing is to take the testimony of yourself and Mr. Ronald Simmons.

You are, we understand, a firearms expert with the FBI, and Mr. Simmons is a firearms expert with the Weapons System Division at Fort Meade, Md.

You are asked to provide technical information to assist the Commission in this work.

Would you raise your right hand and be sworn, please?

You solemnly swear the testimony you are about to give before this Commission will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. Frazier. I do.

The Chairman. You may be seated, please.

Mr. Eisenberg. Mr. Frazier, will you give your name and position?

Mr. Frazier. Robert A. Frazier, Special Agent, Federal Bureau of Investigation, assigned to the FBI Laboratory, Washington, D.C.

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Mr. Eisenberg. And your education?

Mr. Frazier. I have a science degree which I received from the University of Idaho.

Mr. Eisenberg. Could you briefly state your training and experience in the fields of firearms, firearms identification, and ballistics?

Mr. Frazier. Beginning in 1927, I was on the University of Idaho Rifle Team, and the following year, 1938. In 1939 I enlisted in the National Guard and for 2 years was on the National Guard Rifle Team firing both small bore, or .22 caliber weapons, and the large bore, .30 caliber weapons, both being of the bolt-action type weapons.

In 1939 and 1940 I instructed in firearms in the Army of the United States, and acquired additional experience in firing of weapons, training in firing at moving targets, additional training in firing the .45 caliber automatic and machineguns. And to further my firearms, practical firearms training, I received in 1942 a training course offered by the Federal Bureau of Investigation after entering on duty with that organization in—on June 9, 1941. That firearms training course consisted of a basic training in handguns—that is, revolvers and automatic pistols, training in auto-loading rifles, training in submachineguns, shotguns, and various other types of firearms.

One year later, approximately 1943, I received a specialized administrative firearms course which qualified me for training other agents in the field of law-enforcement type firearms.

Over the past 23 years, I have received the regular FBI firearms training, which is a monthly retraining in firearms, and a periodic, or every 4 years, detailed retraining in the basic FBI firearms—the firearms training with the rifle, submachinegun, shotgun, revolver.

In the FBI, training includes firing both at stationary targets and moving targets with both revolver and rifle and shotgun, and includes firing at slow-fire targets—that is, aimed fire for accuracy and rapid fire to increase speed of firing.

Generally in the field of firearms identification, where I have been assigned for 23 years, I received specialized training given in the FBI Laboratory to train me for the position of firearms identification specialist. In that field, we make examinations of bullets and cartridge cases, firearms of various types, for the purpose of identifying weapons as to their calibers, what they are, their manufacturer, their physical characteristics, and determining the type of ammunition which they shoot.

We examine ammunition of various types to identify it as to its caliber, its specific designation, and the type or types of weapons in which it can be fired, and we make comparisons of bullets to determine whether or not they were fired from a particular weapon and make comparisons of cartridge cases for the purpose of determining whether or not they were fired in a particular weapon, or for determining whether or not they had been loaded into or extracted from a particular weapon.

That training course lasted for approximately 1 year. However, of course, the experience in firearms is actually part of the training and continues for the entire time in which you are engaged in examining firearms.

Briefly, that is the summary of the firearms training I have had.

Mr. Eisenberg. Could you estimate the number of examinations you have made of firearms to identify the firearms?

Mr. Frazier. Thousands, I would say—firearms comparisons—I have made in the neighborhood of 50,000 to 60,000.

Mr. McCloy. Have you written any articles on this subject?

Mr. Frazier. Yes. I have prepared an article for the "FBI Law Enforcement Bulletin" on firearms identification, which is published as a reprint and provided to any organization or person interested in the general field of firearms identification.

Mr. McCloy. Have you read most of the literature on the subject?

Mr. Frazier. Yes, I have.

Mr. McCloy. Is there any classical book on this subject?

Mr. Frazier. There are a number of fairly good texts. The basic one, originally published in 1936, is by Maj. Julian S. Hatcher, who
later, as a general, rewrote his book "Firearms Investigation, Identification, and Evidence."

There are many other books published on the subject.

Mr. Eisenberg. May I ask that this person be accepted as a qualified witness on firearms?

The Chairman. Yes, indeed.

Mr. Eisenberg. Mr. Frazier, I now hand you a rifle marked Commission Exhibit 139.

Are you familiar with this weapon?

Mr. Frazier. Yes, I am.

Mr. Eisenberg. And do you recognize it by serial number or by your mark?

Mr. Frazier. By serial number on the barrel, and by my initials which appear on various parts of the weapon.

Mr. Eisenberg. For the record, this is the rifle which was found on the sixth floor of the Texas School Book Depository Building on November 22.

Can you describe this rifle by name and caliber?

Mr. Frazier. It is a caliber 6.5 Italian military rifle, commonly referred to in the United States as a 6.5-mm. Mannlicher-Carcano.

It is a bolt-action clip-fed military rifle.

Do you wish a general physical description of the weapon at this time?

Mr. Eisenberg. Well, no; not at this time.

Can you explain the American equivalent to the 6.5-mm. caliber?

Mr. Frazier. That is the same as .25 caliber. Such weapons in the United States are the .25-20 Winchester, .25-35, the .250 Savage, and the .257 Roberts, all of the same barrel diameter, or approximately the same barrel diameter. So a decimal figure of .257 inch is the equivalent of 6.5 mm.

Mr. Eisenberg. And can you explain what the caliber is a measure of?

Mr. Frazier. The caliber is the measure of the distance across the raised portions or the lands in the barrel. The groove diameter, or the spirals cut in the barrel to form the rifling, will be slightly larger—in this case between 7/1000ths and 8/1000ths of an inch larger than the actual bore diameter.

The caliber is normally determined by the bore diameter.

Mr. Eisenberg. Can you explain how you made the identification of this rifle?

Mr. Frazier. I identified it pictorially by comparing it with pictures in reference books. And the actual identification was of the manufacturer's name appearing on the barrel and serial number, which indicated it was an Italian military rifle.

Mr. Eisenberg. Did you independently determine the caliber of the rifle?

Mr. Frazier. Yes, I did.

Mr. Eisenberg. Can you tell us how you did that?

Mr. Frazier. The caliber and the caliber type may be confusing here.

The caliber, being the diameter of the barrel, is determined in two ways—one, by comparing the barrel with 6.5-mm. Mannlicher-Carcano ammunition, which we also chambered in the weapon and determined that it actually fit the weapon. And, secondly, we measured the width of the barrel with a micrometer. And in that connection, I would like to point out that we made a sulphur cast of the muzzle of the weapon which permitted us to use a micrometer to determine the land width and the groove width in the barrel.

Mr. Eisenberg. Do you have that sulphur cast?

Mr. Frazier. Yes, I do.

Mr. Eisenberg. And that was made by you or under your supervision?

Mr. Frazier. Yes, it was made by me.

Mr. Eisenberg. Mr. Chairman, I ask that this be admitted as Commission Exhibit No. 540.

The Chairman. It will be admitted.

(The article referred to was marked Commission Exhibit No. 540, and received in evidence.)

Mr. Eisenberg. Is there any reason that you can think of why this Exhibit 139 might be thought to be a 7.35- or 7.65-caliber rifle?

Mr. Frazier. From outward appearances, it could be a 7.35-mm. rifle, because, basically, that is what it is. But its mechanism has been rebarreled with a
6.5-mm barrel. Photographs of the weapons are similar, unless you make a very particular study of the photographs of the original model 38 Italian military rifle, which is 7.35 mm.

Early in the Second World War, however, the Italian Government barreled many of these rifles with a 6.5-mm barrel, since they had a quantity of that ammunition on hand. I presume that would be the most logical way of confusing this weapon with one of a larger caliber.

Mr. Eisenberg. And is the 6.5-caliber weapon distinguished from the 7.35-caliber weapon by name?

Mr. Frazier. Yes, it is; it is by the model number. The model 91/38 designates the 6.5-mm rifle, whereas the model 38 designates the 7.35.

Mr. Eisenberg. Have you taken photographs of the various markings on the rifle?

Mr. Frazier. Yes, I did.

Mr. Eisenberg. Do you have those with you?

Mr. Frazier. Actually, I think we forwarded those photographs to the Commission.

Mr. Eisenberg. Are these the photographs that you took, or had taken?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Has the Federal Bureau of Investigation been supplied with information concerning the meanings and significances of these various markings?

Mr. Frazier. Yes, sir; we have.

Mr. Eisenberg. Can you state the source of that information?

Mr. Frazier. This information came to us by mail as a result of an inquiry of the Italian Armed Forces Intelligence Service, abbreviated SIGAR, by letter dated March 28, 1944, through the FBI representative in Rome, Italy.

The information was classified as secret by the Italian Government, who have advised us that the material may be released to the Commission. However, they desire the retention of the information in a secret category.

The Chairman. Is this essential to the proof?

If it is not, I think we would rather not have it, because the fewer things we have to keep in secret, the better the situation is for us.

Mr. Eisenberg. Off the record.

(Discussion off the record.)

Mr. Eisenberg. Back on the record.

Based on your experience with firearms, is the placement of a specific serial number on a weapon generally confined to one weapon of a given type?

Mr. Frazier. Yes, it is. Particularly—may I refer to foreign weapons particularly?

The serial number consists of a series of numbers which normally will be repeated. However, a prefix is placed before the number, which actually must be part of the serial number, consisting of a letter.

Mr. Eisenberg. Have you been able to confirm that the serial number on this weapon is the only such number on such a weapon?

Mr. Frazier. Yes, it is.

Mr. Eisenberg. All right.

Now, without reference to any classified information, could you briefly describe the markings shown on these photographs?

Mr. Frazier. The first photograph is an overall photograph of the rifle.

Mr. Eisenberg. Excuse me.

These photographs—when you say "first photograph"—these photographs are marked No. 1, No. 2, et cetera, on the back.

Mr. Frazier. Yes, they are.

Photograph No. 1 is an overall photograph of the rifle.

Photograph No. 2 is made of the top of the barrel, showing the serial number C90.

Photograph No. 3 is also of the top of the rifle, showing a portion of the inscription on the telescopic sight, and the figures 1940, which is the manufacturer's date, the words "Made Italy" and a figure in the form of a crown, under that the letters "R-E," and then a portion of the word "Terni."

Mr. Eisenberg. Can you explain the significance of "Terni?"
Mr. Frazer. Terni is the location for an Italian ordnance plant in Italy where rifles are made, and it is apparent that this weapon was made in Terni, because it is stamped with that name.

Mr. Eisenberg. And the significance of that crown?

Mr. Frazer. I think that would be just an Italian identification mark or proof mark.

Mr. Eisenberg. And are the words “Made Italy” likely to have been put on the weapon at the time of manufacture or subsequently?

Mr. Frazer. No, sir; the words “Made Italy” would be stamped on the weapon by a purchaser or an individual desiring to send the weapon to another country, to establish actually its origin.

Photograph No. 4 is again of the top of the weapon showing the same information—1940. “Made Italy,” the crown, the place it was made, and the inscription “Caliber 6.5” across the top of the rear sight.

Photograph No. 5 shows a small circle which appears on the forward end of the receiver, or that portion into which the barrel is screwed, with the words “TNI” in the circle, and over these letters is again a small crown. This could be a proof mark or an inspector’s stamp.

Photograph No. 6 is of an inscription on the side of the rear sight which has the appearance of the letter “I,” or the letter “I,” followed by a capital letter “A,” and the capital letter “G,” with the numbers “47,” and “2,” stamped underneath them. I do not know what the significance of that is. It could be, again, an inspector’s stamp or a proof mark of some type.

Photograph No. 7 is made of the cocking piece on the end of the bolt, which gives the word “Rocca.” This apparently would be the name of the manufacturer of that part of the rifle.

Photograph No. 8 is an inscription “PG” on the top of the bolt of the weapon. This inscription—I do not know of my own knowledge what that is—but it could be the mark of a manufacturer or a proof mark or an inspector’s mark made at the time the handle was made to be welded to the bolt.

Photograph No. 9 was taken of the bottom of the receiver of the weapon, with the stock removed. It shows the Number “40,” which could refer again to the year of manufacture, 1940, on the receiver, and at the rear of the photograph a small lettered inscription referring again to an inspector stamp, a proof stamp, of some nature. The identity of this, I do not know.

Mr. Eisenberg. Mr. Chairman, I ask that these photographs be admitted as a group under the number 541.

The Chairman. You are going to put all of them in under one number?

Mr. Eisenberg. Yes. They have the subnumbers on the back, which will differentiate them.

The Chairman. They will be admitted.

(The documents referred to were marked Commission Exhibit No. 541, and received in evidence.)

Mr. Eisenberg. Can you explain why someone might call Exhibit 189 a German-made Mauser rifle or a Mauser bolt-action rifle?

Mr. Frazer. The Mauser was one of the earliest, if not the earliest, and the basic bolt-action rifle, from which many others were copied. And since this uses the same type of bolt system, it may have been referred to as a Mauser for that reason.

Mr. Eisenberg. Does this weapon show—how much use does this weapon show?

Mr. Frazer. The stock is worn, scratched. The bolt is relatively smooth, as if it had been operated several times. I cannot actually say how much use the weapon has had. The barrel is—was not, when we first got it, in excellent condition. It was, I would say, in fair condition. In other words, it showed the effects of wear and corrosion.

Mr. Eisenberg. Is this weapon—

The Chairman. I didn’t get that last.

Mr. Frazer. It showed the effects of wear and corrosion.

Mr. Eisenberg. Is this weapon used when it is sold into the United States?

Mr. Frazer. Yes, it is a surplus type of weapon.

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Mr. Eisenberg. So that it is impossible to attribute any given amount of wear to the last user?

Mr. Frazier. Yes, sir; it is impossible.

Mr. Eisenberg. Have you measured the dimensions of this rifle assembled, and disassembled?

Mr. Frazier. Yes, I have.

Mr. Eisenberg. Could you give us that information?

Mr. Frazier. The overall length is 46 1/4 inches. It weighs 8 pounds even.

Mr. McCloy. With the scope?

Mr. Frazier. Yes, with the scope.

The Chairman. And the sling?

Mr. Frazier. That is with the sling, yes, sir. The sling weighs 4 1/2 ounces.

The stock length is 34 1/2 inches, which is the wooden portion from end to end with the butt plate attached. The barrel and action from the muzzle to the rear of the tang, which is this portion at the rearmost portion of the metal, is 23.9 inches. The barrel only is 21.13 inches.

Mr. Eisenberg. When you say, “this portion,” Mr. Frazier, I don’t think that is coming down clear in the record. I wonder whether you could rephrase that so as to describe the part of the barrel or part of the stock to which you are pointing when you say “tang.”

Mr. Frazier. The tang is the rear of the receiver of the weapon into which the rear mounting screw is screwed to hold the rearmost part of the metal action of the weapon into the wooden stock. From the end of that portion to the muzzle of the weapon is 23.9 inches.

Mr. Eisenberg. And the length of the longest component when the rifle is disassembled, Mr. Frazier?

Mr. Frazier. 34 1/2 inches, which is the length of the stock, the wooden portion.

Mr. Eisenberg. Can you describe to us the telescopic sight on the rifle in terms of—

Mr. McCloy. Before you get to the sight, can I ask a question?

Mr. Eisenberg. Surely.

Mr. McCloy. How soon after the assassination did you examine this rifle?

Mr. Frazier. We received the rifle the following morning.

Mr. McCloy. Received it in Washington?

Mr. Frazier. Yes, sir.

Mr. McCloy. And you immediately made your examination of it then?

Mr. Frazier. We made an examination of it at that time, and kept it temporarily in the laboratory.

It was then returned to the Dallas Police Department, returned again to the laboratory—the second time on November 27th, and has been either in the laboratory’s possession or the Commission’s possession since then.

Mr. McCloy. When you examined the rifle the first time, you said that it showed signs of some corrosion and wear?

Mr. Frazier. Yes, sir.

Mr. McCloy. Was it what you would call pitted, were the lands in good shape?

Mr. Frazier. No, sir; the lands and the grooves were worn, the corners were worn, and the interior of the surface was roughened from corrosion or wear.

Mr. McCloy. Was there metal fouling in the barrel?

Mr. Frazier. I did not examine it for that.

Mr. McCloy. Could you say roughly how many rounds you think had been fired since it left the factory, with the condition of the barrel as you found it?

Mr. Frazier. No, sir; I could not, because the number of rounds is not an indication of the condition of the barrel, since if a barrel is allowed to rust, one round will remove that rust, and wear the barrel to the same extent as 10 or 15 or 50 rounds just fired through a clean barrel.

Mr. McCloy. Thank you.

Mr. Eisenberg. Could you describe the telescopic sight on the rifle? Magnification, country of origin?

Mr. Frazier. It is a four-power telescopic sight employing crosshairs in it as a sighting device, in the interior of the scope.

It is stamped “Optics Ordnance Incorporated, Hollywood California,” and
under that is the inscription “Made in Japan.” It is a very inexpensive Japa-
ese telescopic sight.

The mount attached to it was also made in Japan.
Mr. Eisenberg. Have you removed the mount?
Mr. Frazier. Yes, I have.
Mr. Eisenberg. How many holes did you find drilled into the receiver?
Mr. Frazier. There are two holes in the receiver.
Mr. Eisenberg. Could you form an opinion as to whether these were original
holes or whether new holes—new and larger holes had been formed over the
original holes?
Mr. Frazier. Normally, the receiver would have no holes at all, and would
have to be drilled and tapped for the screws. In the sight itself there normally
are three holes, two of which have been enlarged to accommodate the
two mounting screws presently holding the mount to the rifle.
Mr. Eisenberg. Do you think, based on your experience with types of screws
used in mounts, that these were the original screws and the original holes for
the screws?
Mr. Frazier. I could not say—I could not answer that specifically. However,
they appear to be the same type of screw as is present on the rest of the mount—
although they are somewhat larger in size than the original holes which is
present in the lower portion of the mount.
Mr. Eisenberg. Now, I now hand you a rifle which is marked C-250. Are
you familiar with this rifle?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. Can you describe it briefly?
Mr. Frazier. It is an identical rifle physically to the rifle Commission’s Ex-
hibit 139, in that it is the same caliber, .35-m. Mannlicher-Carcano Italian
Military rifle, Model 91/38.
Mr. Eisenberg. Did you attempt to determine by use of this rifle whether
the scope was mounted on Exhibit 139 by the firm which is thought to have
sold Exhibit 139?
Mr. Frazier. Would you repeat that, please?
Mr. Eisenberg. Yes.
Did you make an attempt to determine, by use of this C-250, whether the
firm which had sold Exhibit 139 had mounted the scope on Exhibit 139?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. Can you describe how you made that attempt?
Mr. Frazier. We contacted the firm, Klein’s Sporting Goods in Chicago, and
asked them concerning this matter to provide us with a similar rifle mounted in
the way in which they normally mount scopes of this type on these rifles, and
forward the rifle to us for examination.
In this connection, we did inform them that the scope should be in approxi-
mately this position on the frame of the weapon.
Mr. Eisenberg. Pardon me, Mr. Frazier. When you say “this position,” so
that the record is clear could you—
Mr. Frazier. Oh; yes; in the position in which it now is, approximately three-
eighths of an inch to the rear of the receiver ring.
Mr. Eisenberg. On the—
Mr. Frazier. On the C-250 rifle.
When we received the rifle C-250, we examined the mount and found that
two of the holes had been enlarged, and that screws had been placed through
them and threaded into the receiver of the C-250 rifle.
The third hole in the mount had not been used.
We also found that an identical scope to the one on the Commission’s rifle
139 was present on the C-250 rifle.
Mr. Eisenberg. Were the screws used in mounting the C-250 rifle—in mounting
the scope on the C-250 rifle—type of screws as those used in mounting the scope
on Exhibit 139?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. And the holes were the same dimensions?
Mr. Frazier. Yes, they are. And the threads in the holes are the same.
Mr. Eisenberg. Mr. Chairman, I would like C-250 admitted into evidence as Commission Exhibit 542.
The Chairman. It may be admitted.
(The article referred to was marked Commission Exhibit No. 542, and received in evidence.)
The Chairman. At this time I will interrupt to say I must now leave to attend a session of the Supreme Court, and I will return at the conclusion of the session.
In the meantime, Mr. McCloy will preside at the Commission hearing, and in the event he should be required to leave, Mr. McCloy, whatever Commissioner is here will conduct the examination in his absence.
(At this point, Chairman Warren withdrew from the hearing room.)
Mr. Eisenberg. Have you examined the sling on Commission Exhibit 139?
Mr. Frazier. Yes, I did.
Mr. Eisenberg. Do you feel that this is—that this sling was originally manufactured as a rifle sling?
Mr. Frazier. No, sir; it is not in any way similar to a normal sling for a rifle. It appears to be a sling from some carrying case, camera bag, musical-instrument strap, or something of that nature.
We have made attempts to identify it, with no success.
Mr. Eisenberg. Apart from the addition of this sling and mounting of the telescopic sight, have any modifications been made to the C-130 rifle—in the Commission Exhibit 139 rifle?
Mr. Frazier. No, sir.
Mr. McCloy. You would suggest, I gather, Mr. Frazier, that this is a homemade sling?
Mr. Frazier. Yes, sir; it appears to have been cut to length by inserting this strap, or this sling, on the rifle, and then trimming off the excess ends of the two straps to fit.
Mr. McCloy. How would that broad patch on the sling—how would that be used, in your judgment, in firing the rifle? Would it be wrapped around the base of your—
Mr. Frazier. I find it very difficult to use the rifle with a sling at all. The sling is too short, actually, to do more than put your arm through it.
Mr. McCloy. You get quite a leverage with that?
Mr. Frazier. Yes, sir, you do, in one direction. But it is rather awkward to wrap the forward hand into the sling in the normal fashion.
Mr. McCloy. This gives a pretty tight—
Mr. Frazier. It can be used. But I don’t feel that actually the position of this broad piece is of too much significance as far as use of the sling goes.
Mr. McCloy. But certainly the sling would tend to steady the aim, even in this crude form?
Mr. Frazier. Oh, yes.
Mr. McCloy. It would make more easy an offhand shot than if you didn’t have a sling? It would make it more accurate?
Mr. Frazier. It would assist more in offhand than any other type of shooting, yes.
Mr. Eisenberg. Returning to the scope for a moment, on the basis of the experiment, so to speak, which you had Klein’s conduct, would you form an opinion as to whether the telescopic sight was mounted on Exhibit 139—was likely to have been mounted—by Klein’s, or likely to have been mounted subsequently?
Mr. Frazier. Well, I could not deduce from that—from the way the scope is mounted—who mounted it. I can only say that the two are mounted in identical fashion. And it is possible that the same person or persons mounted the two scopes.
Mr. Eisenberg. Could you briefly explain the operation of this rifle, the bolt action and the clip-feed mechanism?
Mr. Frazier. Yes, sir; the weapon is loaded by turning up the bolt handle, drawing the bolt to the rear, and inserting the clip from the top of the weapon, after the clip has been loaded with the number of rounds you desire to load.
The maximum number of rounds the clip holds is six. However, the weapon can be loaded with a clip holding 5, 4, 3, 2, or 1 round.

This is done by inserting the clip in the rear portion of the ejection port, and pushing it downwards until it clears the bottom of the bolt. The weapon then is loaded by moving the bolt forward. It picks up one cartridge out of the clip, carries it into the chamber of the weapon, and the bolt is then locked by turning down.

To fire the weapon, it is merely necessary to pull the trigger, since the closing of the bolt has cocked the cocking piece on the weapon.

Mr. Eisenberg. Can you proceed to show the extraction and ejection mechanism?

Mr. Frazier. Yes, sir. The extraction is merely by raising the bolt and drawing it to the rear. When the cartridge is first loaded, the rim on the base of the cartridge is caught under the extractor in the face of the bolt, so that drawing the bolt to the rear draws the fired cartridge or a loaded cartridge if it has not been fired, out of the chamber to the rear, where the opposite side of the cartridge strikes a projection in the ejection port called the ejector.

The ejection strikes on the opposite side of the case from the extractor, causing the shell to be thrown out of the weapon on the right-hand side.

Mr. Eisenberg. Now, to fire the next shot, is any further action necessary, apart from closing the bolt and pulling the trigger, if remaining cartridges are in the clip?

Mr. Frazier. No, sir.

Mr. Eisenberg. Could you pull out the clip and explain any markings you find on it?

Mr. Frazier. The only markings are the manufacturer's markings, "SML," on the base of the clip, and a number, 302. The significance of that number I am not aware of. It could be a part number or a manufacturer's code number.

Mr. Eisenberg. Is there any reason that you can think of why someone might call that a five-shot clip?

Mr. Frazier. No, sir, unless they were unfamiliar with it. There is an area of confusion in that a different type of rifle shooting larger ammunition, such as a .30-06 or a German Mauser rifle, uses five-shot clips, and the five-shot clip is the common style or size of clip, whereas this one actually holds six.

Mr. Eisenberg. Have you had occasion to purchase ammunition for this rifle?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Does the ammunition come in the clip?

Mr. Frazier. Normally it does not. The ammunition that we have purchased for this rifle comes in 20-shot boxes. It is possible—and I say this as a result of reading advertisements—to buy ammunition for this rifle, and to receive a clip or clips at the same time, but not necessarily part of the same shipment.

Mr. Eisenberg. When you ordered C-230, which is now Commission Exhibit 542, did you receive a clip with that rifle?

Mr. Frazier. No, sir.

Mr. Eisenberg. Would you deduce, therefore, that the clip—that someone wishing to shoot that rifle and use a clip in the rifle would have purchased the clip later?

Mr. Frazier. They would have to acquire it from some source, yes.

Mr. Eisenberg. Is it commonly available?

Mr. Frazier. Yes, sir.

Mr. McCloy. Can you use that rifle without the clip?

Mr. Frazier. Yes; you can.

Mr. McCloy. What is the advantage of the clip?

Mr. Frazier. It permits repeated firing of the weapon without manually loading one shot at a time.

Mr. McCloy. The only other way you can fire it is by way of manual load?

Mr. Frazier. Yes, sir; one shot at a time.

Mr. McCloy. When you say a six-cartridge clip, could that gun have been fired with the clip fully loaded and another one in the chamber?

Mr. Frazier. Yes, sir.

Mr. McCloy. The same as the .30-06?

Mr. Frazier. Yes, sir; the weapon will hold a maximum of seven.
Mr. Eisenberg. I now hand you a cartridge in an envelope, marked Commission Exhibit 141. Are you familiar with this cartridge?

Mr. Frazier. Yes; I am. I received this cartridge for examination in the FBI laboratory, submitted to me as a cartridge removed from the rifle at the time it was recovered.

Mr. Eisenberg. Can you describe that cartridge in terms of name, manufacturer, and country of origin?

Mr. Frazier. It is a 6.5 mm. Mannlicher-Carcano cartridge, manufactured by the Western Cartridge Co., at East Alton, Ill.

It is loaded with a full metal-jacketed bullet of the military type. Cartridges of this type which I have examined, having this type of bullet, have bullets weighing 160 to 161 grains.

Mr. McCloy. When you mentioned that cartridge as being a Mannlicher-Carcano cartridge, could that be fired, for example, in a Mannlicher 6.5 Schoenauer?

Mr. Frazier. I am not familiar with that.

Mr. McCloy. That is the normal sporting rifle—that Mannlicher Schoenauer is the normal 6.5 Austrian sporting rifle that you buy. I just wondered if it was the same cartridge.

Mr. Frazier. I am sorry. I don't know whether there is a distinction between these two or not.

Mr. McCloy. I happen to have one of those. And I was just wondering if it was the same cartridge.

Mr. Eisenberg. Mr. Frazier, I now hand you a series of three cartridge cases. I ask you whether you are familiar with these cartridge cases.

Mr. Frazier. Yes; I am. I received these cartridge cases on two different occasions for examination in the laboratory, and comparison with the rifle.

Mr. Eisenberg. Do these cases have your mark on them?

Mr. Frazier. Yes; they do. Each is marked with my initials and the inscription for identification purposes.

Mr. Eisenberg. Mr. Chairman, I would like to introduce these cartridge cases into evidence as Commission Exhibits 543, 544 and 545.

Mr. McCloy. They may be admitted.

(The articles referred to were marked Commission Exhibits Nos. 543, 544, and 545 and received in evidence.)

Mr. McCloy. Will you introduce evidence to show where they came from?

Mr. Eisenberg. Well, sir, the record will show at the conclusion of the bearings where they came from. This witness is able to identify them only as to his examination.

Mr. McCloy. I understand that. I understand that witness cannot identify them. But I simply asked for the record whether you have evidence to show where they did come from.

Mr. Eisenberg. Yes; for the record, these cartridges were found on the sixth floor of the School Book Depository Building. They were found near the southeast corner window—that is, the easternmost window on the southern face of the sixth floor of that building.

Mr. Frazier, are these cartridge cases which have just been admitted into evidence the same type of cartridge—from the same type of cartridge—as you just examined, Commission Exhibit No. 141?

Mr. Frazier. Yes; they are.

Mr. Eisenberg. That is, 6.5 mm. Mannlicher-Carcano, manufactured by the Western Cartridge Co.?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. You give the weight of the bullet which is found in this type of cartridge. Could you give us a description of the contour of the bullet, and its length?

Mr. Frazier. The bullet has parallel sides, with a round nose, is fully jacketed with a copper-alloy coating or metal jacket on the outside of a lead core. Its diameter is 6.65 millimeters. The length—possibly it would be better to put it in inches rather than millimeters. The diameter is .267 inches, and a length of 1.165, or approximately 1.2 inches.

Mr. McCloy. You say that the diameter is 6.65. Did you mean 6.65 or 6.5 millimeters?
Mr. Frazier. I was looking for that figure on that. It is about 6.6—6.65 millimeters.

The bullet, of course, will be a larger diameter than the bore of the weapon to accommodate the depths of the grooves in the barrel.

On the base of the bullet is a crimp ring, or a canneler, which is located two-tenths of an inch from the base up the bullet and which is 6/100ths of an inch in width—that is, it is a band around the bullet 6/100ths of an inch wide.

I believe that is a description of the bullet.

Mr. Eisenberg. Have you tested Commission Exhibit 139 with the type of ammunition you have been looking at to determine the muzzle velocity of that type of ammunition in this weapon?

Mr. Frazier. Yes, sir. The tests were run to determine the muzzle velocity of this rifle, using this ammunition, at the Naval Research Laboratory in Washington, D.C., on December 2, 1955, using two different lots of ammunition—Lot No. 6,000 and Lot No. 6,003.

I might point out that there were four lots of ammunition manufactured by the Western Cartridge Co., only two of which are available.

Mr. Eisenberg. Can you give the results?

Mr. Frazier. Possibly I can give the results shot by shot, so the record will show each one, and then give an average for them.

Mr. Eisenberg. Fine.

Mr. Frazier. The first shot, Lot 6,000, the velocity was 2,120.7 feet per second.

Second shot, Lot 6,000, velocity 2,130.3 feet per second.

The third shot, velocity—same lot—velocity 2,178.9 feet per second.

The third shot, velocity—and this is Lot No. 6,003—velocity was 2,184.5 feet per second.

The fourth shot, Lot No. 6,003, was 2,137.6 feet per second.

Fifth shot, Lot No. 6,000, 2,162.7 feet per second.

The sixth shot, Lot 6,003, 2,134.5 feet per second.

An average of all shots at 2,153 feet per second.

Mr. Eisenberg. How would you characterize the differences between the muzzle velocities of the various rounds in terms of whether that difference was a large or small difference?

Mr. Frazier. This is a difference well within the manufacturer's accepted standards of velocity variations. They permit in their standard ammunition manual, which is a guide to the entire industry in the United States, a 40-foot-per-second plus or minus, variation shot to shot in the same ammunition.

Mr. Eisenberg. Have you calculated the muzzle energy of this 6.5 millimeter ammunition in this weapon?

Mr. Frazier. It was furnished by letter to the Commission. Yes, sir—the muzzle energy was calculated on the basis of the average velocity of 2,153 feet per second as 1,676 foot-pounds.

Mr. Eisenberg. This is a calculation rather than a measurement?

Mr. Frazier. Necessarily a calculation, because it is merely a term used to compare one bullet against another rather than for any practical purposes because—because of the bullet's extremely light weight.

The bullet's velocity and weight, and gravity enter into the determination of its energy in foot-pounds.

Mr. Eisenberg. Is the 6.5 millimeter Mannlicher-Carcano with which we are dealing an accurate type of ammunition as opposed to other types of military ammunition—as compared, I should say, with other types of military ammunition?

Mr. Frazier. I would say it is also accurate. As other types of ammunition the 6.5 millimeter cartridge or bullet is a very accurate bullet, and ammunition of this type as manufactured in the United States would give fairly reasonable accuracy. Other military cartridges may or may not give accurate results.

But the cartridge inherently is an accurate cartridge.

Mr. Eisenberg. Is this type of cartridge readily available for purchase?

Mr. Frazier. Yes; it is. Information we have indicates that 2 million rounds of this ammunition was reimported into this country and placed on sale.

Mr. Eisenberg. Commission Exhibit No. 141, the cartridge found in the chamber—I should say, was found in the chamber. Do you draw any inference
from the fact that the cartridge was found in the chamber? In your experience, does one automatically reload whether or not one intends to fire, or is there a special significance in the fact that the cartridge had been chambered?

Mr. Frazier. I would say no, there would be no inference which I could draw based on human behavior as to why someone would or would not reload a cartridge. Normally, if you were—in my experience—shooting at some object, and it was no longer necessary to shoot, you would not reload.

You may or may not reload. It would be a normal thing to automatically reload. But not necessarily in every instance.

Mr. McCloy. Do you have any information of your own knowledge as to whether this cartridge was in the chamber or not at the time the rifle was found?

Mr. Frazier. Only as furnished to me—it was submitted as having been removed from the rifle by the Dallas Police Department.

Mr. McCloy. As having been removed from the chamber?

Mr. Frazier. From the chamber of the rifle.

Mr. McCloy. But you did not remove it yourself?

Mr. Frazier. No, sir.

Mr. Eisenberg. Did you make a test to determine the pattern of the cartridge-case ejection of Commission Exhibit 139?

Mr. Frazier. Yes, sir; I made two studies in connection with the ejection pattern—one to determine distance and one to determine the angle at which the cartridge cases leave the ejection port.

Mr. Eisenberg. And did you summarize your examination by diagrams?

Mr. Frazier. Yes; I did.

Mr. Eisenberg. Could you show us those diagrams?

Mr. Frazier. In this diagram—

Mr. Eisenberg. Excuse me just a second, Mr. Frazier. Were these diagrams prepared by you?

Mr. Frazier. Yes; they were—not the actual physical diagrams, but the figures on the diagrams were furnished by me to the draftsman.

Mr. Eisenberg. Mr. Chairman, may I introduce these diagrams as Commission Exhibits Nos. 546 and 547?

Mr. McCloy. They may be admitted.

(The documents referred to were marked Commission Exhibits Nos. 546 and 547, and were received in evidence.)

Mr. Eisenberg. Could you give us the results of your tests by using these diagrams, Mr. Frazier?

Mr. Frazier. Yes, sir.

In this test, Commission Exhibit 546, the diagram illustrates the positions on the floor at which cartridge cases landed after being extracted and ejected from the rifle, Commission's Exhibit 139. In the top portion of Exhibit 546, the barrel was held depressed at a 45-degree angle, and in the lower half of the exhibit it shows the pattern with the barrel held in a horizontal position. Each spot marked with a figure on the diagram shows where one cartridge case landed in both instances, and each one is marked with the distance and the angle to which the cartridge case was ejected.

With the barrel held in the depressed condition, all of the cartridge cases landed within an 85-inch circle located 80 degrees to the right front of the rifle. That may be confusing. It was 80 degrees to the right from the line of sight of the rifle and at a distance of 86 inches from the ejection port.

Now, this circle will not necessarily encompass all cartridge cases ejected from the rifle, since the ejection is determined, not only by the angle of the weapon, but more by the force with which the bolt is operated. A very light force on the bolt can cause the cartridge case to tip gently out and fall at your feet. However, under normal conditions of reloading in a fairly rapid manner, we found the cartridge cases to land in this circle.

The same situation is true of the test made with the muzzle in the horizontal condition.

All of the cartridge cases landed within a 47-inch circle, which was located at right angles to the ejection port, or 90 degrees from the line of sight, and at a distance 88 inches from the ejection port.
In both of these tests, the ejection port of the weapon was held 32 inches above the floor.

In the second test performed, Commission Exhibit 547, the test was made to ascertain how high above the ejection port a cartridge case would fly as it was being ejected.

After ejecting numerous cartridge cases from the weapon with the barrel held in a depressed condition, it was found that the cartridge cases did not exceed two inches above the level of the ejection port. And with the muzzle held horizontally, it did not exceed 12 inches above the level of the ejection port.

Mr. Eisenberg. In making these tests, was the bolt pulled with a normal degree of rifle pull?

Mr. Frazier. It was pulled with various pulls, to determine what the effect would be with different speeds of the bolt.

Mr. Eisenberg. How did you select the distance above the floor at which the rifle was fired?

Mr. Frazier. We selected a distance which we thought might be typical of a condition which would give an overall picture of the ejection pattern, and not from any basis of previous information as to possibly how the weapon had been fired previously. Thirty-two inches happened to be approximately table height, so that we could control the height of the weapon readily.

Mr. Eisenberg. I now hand you three Commission Exhibits, 510, 511, and 512, which are photographs which have been identified as giving the location of the cartridges—cartridge cases—Nos. 548, 544, and 545, on the sixth floor of the School Book Depository Building. I ask you to examine these pictures, and to determine whether if the rifle had been fired from the window shown in these pictures, the location of the cartridge cases is consistent with the results of the tests you ran to determine the ejection patterns.

Mr. Frazier. I would say yes; it is consistent—although the cartridge cases are—two of them—against the wall. There is a stack of boxes fairly near the wall, and the position of the cartridge cases could very well have been affected by the boxes. That is, they could strike the box and bounce for several feet, and they could have bounced back and forth in this small area here and come to rest in the areas shown in the photographs.

Mr. Eisenberg. In making your tests, did you notice much ricochet?

Mr. Frazier. Yes; considerable. Each time a cartridge case hit the floor, it would bounce anywhere from 8 inches to 10 to 15 feet.

Mr. McCloy. Make a lot of noise?

Mr. Frazier. Yes; a clatter.

Mr. Eisenberg. Have you tested Commission Exhibit 139 to determine its accuracy under rapid-fire conditions?

Mr. Frazier. Yes; I have.

Mr. Eisenberg. Can you describe these tests?

Mr. Frazier. A series of three tests were made. When we first received the rifle, there was not an opportunity to test it at long range, so we tested it at short range. After we had obtained sample bullets and cartridge cases from it, we fired accuracy and speed tests with it. Three examiners did the firing, all three being present at the same time.

The first tests were made at 15 yards, and shooting at a silhouette target.

Mr. Eisenberg. A silhouette of a man?

Mr. Frazier. A paper silhouette target of a man; yes.

Possibly you may wish to mark these, to refer to them.

Mr. Eisenberg. These targets were made by you or in your presence?

Mr. Frazier. These are actually copies of the actual targets. I have the actual targets here, if you would rather use those. However, the markings show better on the copies than they do on the actual targets.

Mr. Eisenberg. Mr. Chairman, I request permission to introduce the copies for the reasons given, as Commission Exhibits 548 and 549.

Mr. McCloy. You have made these copies, Mr. Frazier?

Mr. Frazier. Well, I had them made. They are actual xerox copies of the original targets, which are black, and do not show the markings placed around the holes.

Mr. Eisenberg. Off the record.
(Discussion off the record.)

Mr. McCloy. Back on the record.

Mr. Frazier, you have the original targets that were used in this experiment.

Mr. Frazier. Yes, sir.

Mr. McCloy. Were you one of the three that fired?

Mr. Frazier. Yes, sir.

Mr. McCloy. Can you identify your target as distinguished from the other two?

Mr. Frazier. Yes, sir.

Mr. McCloy. Do you have the target that you fired?

Mr. Frazier. I fired—yes, I do. However, another examiner also fired at this same target.

Mr. McCloy. Have you made a copy of that—or did you cause a copy of that target to be made?

Mr. Frazier. Yes, sir.

Mr. McCloy. And you have that with you?

Mr. Frazier. Yes; I do.

Mr. McCloy. Have you marked it yet?

Mr. Eisenberg. No. That would be 548.

Mr. McCloy. Suppose you identify that copy.

Mr. Eisenberg. This copy that you are presenting to us has initials at the bottom “CC-R CK”?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. And the numbers and letters D-2 on the right-hand margin?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. And that has been copied under your supervision?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Mr. Chairman?

Mr. McCloy. That can be admitted as Commission Exhibit 548.

(The document referred to was marked Commission Exhibit No. 548, and received in evidence.)

Mr. McCloy. Now, is Commission Exhibit 548 an accurate copy of the target which you have—that you fired, and which you presented?

Mr. Frazier. Yes; it is.

Mr. Eisenberg. Now, you also have a copy here which has the name on it Killion, and similar initials, letters, and numbers to the other target. Is this an accurate copy which you had prepared?

Mr. Frazier. Yes, sir. That was the target fired by Charles Killion in my presence.

Mr. Eisenberg. May I have this admitted as 549?

Mr. McCloy. It may be admitted.

(The document referred to was marked Commission Exhibit No. 549, and received in evidence.)

Mr. Eisenberg. This test was performed at 15 yards, did you say, Mr. Frazier?

Mr. Frazier. Yes, sir. And this series of shots we fired to determine actually the speed at which the rifle could be fired, not being overly familiar with this particular firearm, and also to determine the accuracy of the weapon under those conditions.

Mr. Eisenberg. And could you give us the names of the three agents who participated?

Mr. Frazier. Yes, sir. Charles Killion, Cortlandt Cunningham, and myself.

Mr. Eisenberg. And the date?

Mr. Frazier. November 27, 1933.

Mr. Eisenberg. How many shots did each agent fire?

Mr. Frazier. Killion fired three, Cunningham fired three, and I fired three.

Mr. Eisenberg. And do you have the times within which each agent fired the three shots?

Mr. Frazier. Yes, sir. Killion fired his three shots in nine seconds, and they are shown—the three shots are interlocking, shown on Commission Exhibit No. 549. Cunningham fired three shots—I know the approximate number of seconds was seven.)
Cunningham's time was approximately seven seconds.
Mr. Eisenberg. Can you at a later date confirm the exact time?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. And you will do that by letter to the Commission, or if you happen to come back by oral testimony?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. And your time, Mr. Frazier?
Mr. Frazier. For this series, was six seconds, for my three shots, which also were on the target at which Mr. Cunningham fired, which is Exhibit 548.
Mr. Eisenberg. Could you characterize the dispersion of the shots on the two targets which you have been showing us, 548 and 549?
Mr. Frazier. The bullets landed approximately—in Killoon's target, No. 549, approximately 2 1/2 inches high, and 1 inch to the right, in the area about the size of a dime, interlocking in the paper, all three shots.
On Commission Exhibit 548, Cunningham fired three shots. These shots were interlocking, or within an eighth of an inch of each other, and were located approximately 4 inches high and 1 inch to the right of the aiming point. The three shots which I fired were—landed in a three-quarter inch circle, two of them interlocking with Cunningham's shots, 4 inches high, and approximately 1 inch to the right of the aiming point.
Mr. Eisenberg. Can you describe the second series of tests?
Mr. Frazier. The second test which was performed was two series of three shots at 35 yards, instead of 15 yards. I fired both of these tests, firing them at a cardboard target, in an effort to determine how fast the weapon could be fired primarily, with secondary purpose accuracy.
We did not attempt—I did not attempt to maintain in that test an accurate rate of fire.
This is the actual target which I fired.
Mr. Eisenberg. And that target has all six holes in it?
Mr. Frazier. Yes, sir—two series of three holes, the first three holes being marked with the No. 1, and the second series being marked No. 2.
Mr. Eisenberg. Mr. Chairman, I would like this introduced as 550.
Mr. McCloy. That will be admitted.
(The document referred to was marked Commission Exhibit No. 550, and received in evidence.)
Mr. Eisenberg. Could you describe for the record the dispersion on the two series?
Mr. Frazier. Yes, sir. The first series of three shots were approximately—from 4 to 5 inches high and from 1 to 2 inches to the right of the aiming point, and landed within a 2-inch circle. These three shots were fired in 4.8 seconds. The second series of shots landed—one was about 1 inch high, and the other two about 4 or 5 inches high, and the maximum spread was 5 inches.
That series was fired in 4.8 seconds.
Mr. Eisenberg. And do you have the date?
Mr. Frazier. That also was on the 27th of November.
Mr. Eisenberg. Same date as the first tests?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. And you performed one more test, I believe?
Mr. Frazier. Yes, sir. We fired additional targets at 100 yards on the range at Quantico, Va., firing groups of three shots. And I have the four targets we fired here.
Mr. Eisenberg. Mr. Chairman, I would like these admitted as 551, 552, 553, and 554.
Mr. McCloy. They may be admitted.
(The documents referred to were marked Commission Exhibits No. 551 through 554, and received in evidence.)
Mr. Eisenberg. Who fired these shots, Mr. Frazier?
Mr. Frazier. I fired them.
Mr. Eisenberg. Can you characterize the dispersion on each of the four targets?
Mr. Frazier. Yes, sir.
On Commission Exhibit 551 the three shots landed approximately 5 inches high and within a 3 1/4-inch circle, almost on a line horizontally across the target. This target had—the other targets were fired on March 16, 1964 at Quantico, Va. These three shots were fired in 6.9 seconds.

The second target fired is Commission Exhibit 552, consisting of three shots fired in 6.2 seconds, which landed in approximately a 4 1/2 to 5-inch circle located 4 inches high and 3 or 4 inches to the right of the aiming point.

Commission Exhibit No. 553 is the third target fired, consisting of three shots which landed in a 3-inch circle located about 2 1/2 inches high and 2 inches to the right of the aiming point.

These three shots were fired in 5.8 seconds.

And Commission Exhibit No. 554, consisting of three shots fired in 6.5 seconds, which landed approximately 5 inches high and 5 inches to the right of the aiming point, all within a 3 1/2-inch circle.

Mr. McCLOY. The first one is not exactly 5 inches to the right, is it?

Mr. FRAZIER. No, sir. The center of the circle in which they all landed would be about 5 inches high and 5 inches to the right.

Mr. Eisenberg. Mr. Frazier, could you tell us why, in your opinion, all the shots, virtually all the shots, are grouped high and to the right of the aiming point?

Mr. FRAZIER. Yes, sir. When we attempted to sight in this rifle at Quantico, we found that the elevation adjustment in the telescopic sight was not sufficient to bring the point of impact to the aiming point. In attempting to adjust and sight-in the rifle, every time we changed the adjusting screws to move the crosshairs in the telescopic sight in one direction it also affected the movement of the impact or the point of impact in the other direction. That is, if we moved the crosshairs in the telescope to the left it would also affect the elevation setting of the telescope. And when we had sighted-in the rifle approximately, we fired several shots and found that the shots were not all landing in the same place, but were gradually moving away from the point of impact. This was apparently due to the construction of the telescope, which apparently did not stabilize itself—that is, the spring mounting in the crosshair ring did not stabilize until we had fired five or six shots.

Mr. Eisenberg. Pardon me, Mr. Frazier. Have you prepared a diagram of the telescopic sight?

Mr. FRAZIER. Yes, sir.

Mr. Eisenberg. I wonder whether you could show us that now to help illustrate the point you are making.

Let me mark that.

This diagram was prepared by you?

Mr. FRAZIER. Yes; it was.

Mr. Eisenberg. And illustrates—

Mr. FRAZIER. Excuse me. The actual diagram was copied by me from a textbook, showing a diagrammatic view of how a telescopic crosshair ring is mounted in a telescope.

Mr. Eisenberg. This is a generalized diagram, rather than a diagram of the specific scope on Exhibit 139?

Mr. FRAZIER. Yes; it is. However, I have checked the scope on Exhibit 139 and found it to be substantially the same as this diagram.

Mr. Eisenberg. Mr. Chairman, may I have this admitted as 555?

Mr. McCLOY. It may be admitted.

(The document referred to was marked Commission Exhibit No. 555, and received in evidence.)

Mr. FRAZIER. Commission Exhibit No. 555 is a diagrammatic drawing of the manner in which the crosshair ring is mounted in Exhibit 139, showing on the right-hand side of the diagram a circular drawing indicating the outer part of the tube, with an inner circle with a crossed line in it representing the crosshairs in the telescope.

There is an elevation-adjusting screw at the top, which pushes the crosshair ring down against a spring located in the lower left-hand portion of the crosshairs, or which allows the crosshair ring to come up, being pushed by the spring on the opposite side of the ring. There is a windage screw on the right-hand side
of the scope tube circle which adjusts the crosshair ring laterally for windage adjustments.

The diagram at the left side of Commission's Exhibit 555 shows diagrammatically the blade spring mounted in the telescope tube which causes the ring to be pressed against the adjusting screws.

We found in this telescope sight on this rifle that this ring was shifting in the telescope tube so that the gun could not be sighted-in merely by changing the screws. It was necessary to adjust it, and then fire several shots to stabilize the crosshair ring by causing this spring to press tightly against the screws, to the point that we decided it would not be feasible to completely sight the weapon insofar as windage goes, and in addition found that the elevation screw could not be adjusted sufficiently to bring the point of impact on the targets down to the sighting point.

And, therefore, we left the rifle as soon as it became stabilized and fired all of our shots with the point of impact actually high and to the right.

Mr. Eisenberg. As I understand it, the construction of the scope is such that after the elevation or windage screw has been moved, the scope does not— is not—automatically pushed up by the blade spring as it should be, until you have fired several shots?

Mr. Frazer. Yes; that is true— when the crosshairs are largely out of the center of the tube. And in this case it is necessary to move the crosshairs completely up into the upper portion of the tube, which causes this spring to bear in a position out of the ordinary, and for this windage screw to strike the side or the sloping surface of the ring rather than at 90 degrees, as it shows in Exhibit 555. With this screw being off center, both in windage and elevation, the spring is not strong enough to center the crosshair ring by itself, and it is necessary to jar it several times, which we did by firing, to bring it to bear tightly so as to maintain the same position then for the next shots.

Mr. Eisenberg. And because of the difficulty you had in stabilizing the crosshair, you did not wish to pursue it to a further refinement, is that correct?

Mr. Frazee. We sighted the scope in relatively close, fired it, and decided rather than fire more ammunition through the weapon, we would use these targets which we had fired.

Mr. Eisenberg. Now, once the crosshairs had been stabilized, did you find that they stayed, remained stabilized?

Mr. Frazee. Yes; they did.

Mr. Eisenberg. How long do you think the crosshairs would remain stabilized in Exhibit 129, assuming no violent jar?

Mr. Frazee. They should remain stabilized continuously.

Mr. Eisenberg. Do you know when the defect in this scope, which causes you not to be able to adjust the elevation crosshair in the manner it should be—do you know when this defect was introduced into the scope?

Mr. Frazee. No; I do not. However, on the back end of the scope tube there is a rather severe scrape which was on this weapon when we received it in the laboratory, in which some of the metal has been removed, and the scope tube could have been bent or damaged.

Mr. Eisenberg. Did you first test the weapon for accuracy on November 27th?

Mr. Frazee. Yes, sir.

Mr. Eisenberg. Have you any way of determining whether the defect pre-existed November 27th?

Mr. Frazee. When we fired on November 27th, the shots were landing high and slightly to the right. However, the scope was apparently fairly well stabilized at that time, because three shots would land in an area the size of a dime under rapid-fire conditions, which would not have occurred if the interior mechanism of the scope was shifting.

Mr. Eisenberg. But you are unable to say whether—or are you able to say whether—the defect existed before November 27th? That is, precisely when it was introduced?

Mr. Frazee. As far as to be unable to adjust the scope, actually, I could not say when it had been introduced. I don’t know actually what the cause is. It may be that the mount has been bent or the crosshair ring shifted.
Mr. Eisenberg. Mr. Frazier, when you were running, let's say, the last test, could you have compensated for this defect?

Mr. Frazier. Yes; you could take an aiming point low and to the left and have the shots strike a predetermined point. But it would be no different from taking these targets and putting an aiming point in the center of the bullet-impact area. Here that would be the situation you would have—an aiming point off to the side and an impact area at the high right corner.

Mr. Eisenberg. If you had been shooting to score bulls-eyes, in a bulls-eye pattern, what would you have—what action, if any, would you have taken, to improve your score?

Mr. Frazier. I would have aimed low and to the left—after finding how high the bullets were landing; you would compensate by aiming low left, or adjusting the mount of the scope in a manner which would cause the hairlines to coincide with the point of impact.

Mr. Eisenberg. How much practice had you had with the rifle before the last series of four targets were shot by you?

Mr. Frazier. I had fired it possibly twenty rounds, fifteen to twenty rounds, and in addition had operated the bolt repeatedly.

Mr. Eisenberg. Does practice with this weapon—or would practice with this weapon materially shorten the time in which three shots could be accurately fired?

Mr. Frazier. Yes, sir; very definitely.

Mr. Eisenberg. Would practice without actually firing the weapon be helpful—that is, a dry-run practice?

Mr. Frazier. That would be most helpful, particularly in a bolt-action weapon, where it is necessary to shift your hand from the trigger area to the bolt, operate the bolt, and go back to the trigger after closing the bolt.

Mr. Eisenberg. Based on your experience with the weapon, do you think three shots could be fired accurately within five seconds if no rest was utilised?

Mr. Frazier. That would depend on the accuracy which was necessary or needed or which you desired. I think you could fire the shots in that length of time, but whether you could place them, say, in a 3- or 4-inch circle without either resting or possibly using the sling as a support (I doubt that you could accommodate that.

Mr. Eisenberg. How—these targets at which you fired stationary at 100 yards—how do you think your time would have been affected by use of a moving target?

Mr. Frazier. It would have slowed down the shooting. It would have lengthened the time to the extent of allowing the crosshairs to pass over the moving target.

Mr. Eisenberg. Could you give an amount?

Mr. Frazier. Approximately 1 second. It would depend on how fast the target was moving, and whether it was moving away from you or towards you or at right angles.

Mr. Eisenberg. Do you think you could shorten your time with further practice with the weapon?

Mr. Frazier. Oh, yes.

Mr. Eisenberg. Could you give us an estimate on that?

Mr. Frazier. I fired three shots in 4.8 seconds at 100 yards with approximately a 3-inch spread, which is the equivalent of a 12-inch spread at a hundred yards. And I feel that a 12-inch relative circle could be reduced to 6 inches or even less with considerable practice with the weapon.

Mr. Eisenberg. That is in the 4.6-second time?

Mr. Frazier. Yes. I would say from 4.8 to 5 seconds, in that area—4.8 is firing this weapon as fast as the bolt can be operated, I think.

Mr. Eisenberg. I am now going to ask you several hypothetical questions concerning the factors which might have affected the aim of the assassin on November 22d, and I would like you to make the following assumptions in answering these questions: First, that the assassin fired his shots from the window near which the cartridges were found—that is, the easternmost window on the south face of the sixth floor of the School Book Depository Building,
which is 90 feet above the ground, and several more feet above the position at which the car was apparently located when the shots were fired.

Second, that the length of the trajectory of the first shot was 175 feet, and that the length of the trajectory of the third shot was 285 feet.

And third, that the elapsed time between the firing of the first and third shots was 5½ seconds.

Based on these assumptions, Mr. Frazier, approximately what lead would the assassin have had to give his target to compensate for its movement—and here I would disregard any possible defect in the scope.

Mr. Frazier. I would say he would have to lead approximately 2 feet under both such situations. The lead would, of course, be dependent upon the direction in which the object was moving, primarily. If it is moving away from you, then, of course, the actual lead of say 2 feet which he would have to lead would be interpreted as a considerably less lead in elevation above the target, because the target will move the 2 feet in a direction away from the shooter, and the apparent lead then would be 1 to 2 feet or 12 inches or 6 inches or something of that nature, due to the movement of the individual.

Mr. Eisenberg. Have you made calculations to achieve the figures you gave?

Mr. Frazier. I made the calculations, but I don't have them with me.

Mr. Eisenberg. Could you supply these to us, either in further testimony or by letter, Mr. Frazier?

Mr. Frazier. I have one object here, a diagram which will illustrate that lead, if you would like to use that. This is drawn to scale from those figures which you quoted as building height, and distances of 175 feet and 285 feet.

Mr. Eisenberg. For the record, these figures are approximations of the figures believed to be involved in the assassination.

Will you supply the data at a later date?

Mr. Frazier. Yes; I can furnish that.

Mr. Eisenberg. May I have permission to introduce this as 556?

Mr. McCoy. That will be admitted.

(The document referred to was marked Commission Exhibit No. 556, and received in evidence.)

Mr. Eisenberg. Could you show the lead in that diagram, Mr. Frazier?

Mr. Frazier. In Commission Exhibit 556, it shows a triangular diagram with the vertical line on the left-hand side illustrating the height of the building. The figures of a 90-foot building height plus—

Mr. Eisenberg. That is height of the muzzle above the ground?

Mr. Frazier. No—window sill—90-foot window sill height above the ground, with an assumed 2-foot height in addition to accommodate the height of the rifle above the possible—the possible height of the rifle above the window sill.

The horizontal line extends outward from the building to a small rectangular block, and then a sloping line illustrates a 5-foot slope from the 175-foot point to the 285-foot point.

(At this point, Representative Boggs entered the hearing room.)

Mr. Frazier. The time of flight of the bullet of approximately 8/100ths of a second and, again, it was necessary to assume—the time of flight of the bullet from the window to this first location of 175 feet is approximately 8/100ths of a second, which means a 2-foot lead on the target. That is, the target would move 2 feet in that interval of time, thereby necessitating shooting slightly ahead of the target to hit your aiming point. That has been diagrammatically illustrated by a 2-foot distance laid off on this rectangular block here, and two lines, very fine lines, drawn back towards the window area.

The right-hand side of Commission's 556 shows the same rectangular block, again with two lines drawn to it, one illustrating the point of aim and the other the amount of lead which would be necessary to strike an object aimed at which was moving, according to the time of flight of the projectile.

Mr. Eisenberg. And you calculated the speed of the car by translating the figures on total time elapsed between first and third shots?

Mr. Frazier. Yes, sir. The time—the speed of the moving object was calculated on the basis of an assumed 5.5-second interval for a distance of 90 feet, which figures out mathematically to be 11.3 miles per hour.

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Mr. Eisenberg. Now, you said before that in order to give this 2-foot lead, you would have to aim 2 inches—for a target going away from you, you would have to aim 2 inches above the target, or in front of the target.

Mr. Frazier. 2 feet in front of the target, which would interpolate into a much lower actual elevation change.

Mr. Eisenberg. The elevation change would be 2 inches, is that it?

Mr. Frazier. Well, no. It would be on the order of 6 to 8 inches.

Mr. Eisenberg. 6 to 8 inches?

Mr. Frazier. Yes.

Mr. Eisenberg. What was your 2-inch figure?

Mr. Frazier. I don't recall.

Mr. Eisenberg. But it is 6 to 8 inches in elevation?

Representative Booes. May I ask a question?

Using that telescopic lens, how would you aim that rifle to achieve that distinction?

Mr. Frazier. Well, it would be necessary to hold the crosshairs an estimated distance off the target, of say, 6 inches over the intended target, so that the shot was fired the crosshairs should be located about 6 inches over your target, and in the length of time that the bullet was in the air and the length of time the object was moving, the object would move into actually, the path of the bullet in approximately 1/10th to 15/100ths of a second.

Mr. Eisenberg. So that if the target of the assassin was the center of the President's head, and he wanted to give a correct lead, where he would have aimed, if we eliminate the possibility of errors introduced by other factors?

Mr. Frazier. He would aim from 6 to 8 inches—approximately 2 inches. I would say, above the President's head, which would actually be 6 inches above his aiming point at the center of the head.

Mr. Eisenberg. How difficult is it to give this—a lead of this size—to this type of target?

Mr. Frazier. It would not be difficult at all with a telescopic sight, because your target is enlarged four times, and you can estimate very quickly in a telescopic sight, inches or feet or lead of any desired amount.

Mr. Eisenberg. Would it be substantially easier than it would be with an open or peep sight?

Mr. Frazier. Yes. It would be much more difficult to do with the open iron sights, the notched rear sight and the blade front sight, which is on Exhibit 120.

Mr. Eisenberg. Now, you have been able to calculate the precise amount of lead which should be given, because you have been given figures. If you had been in the assassin's position, and were attempting to give a correct lead, what lead do you think you would have estimated as being the necessary lead?

Mr. Frazier. It would have been a very small amount, in the neighborhood of a 3-inch lead.

Mr. Eisenberg. As opposed to the 6 or 8 inches?

Mr. Frazier. As opposed to about 6 inches, yes.

Mr. Eisenberg. What would be the consequence of the mistake in assumption as to lead— that is, if you gave a 3-inch lead rather than the correct lead?

Mr. Frazier. It would be a difference of a 3-inch variation in the point of impact on the target.

Mr. Eisenberg. Now, if you had aimed at the center of the President's head, and given a 3-inch lead, again eliminating other errors, where would you have hit, if you hit accurately?

Mr. Frazier. It would be 3 inches below the center of his head—from the top—it would be not the actual center from the back, but the center would be located high. The bullet would strike at possibly the base of the skull.

Mr. Eisenberg. Now, suppose you had given no lead at all and aimed at that target and aimed accurately. Where would the bullet have hit?

Mr. Frazier. It would hit the base of the neck—approximately 6 inches below the center of the head.

Mr. Eisenberg. Mr. Frazier, would you have tried to give a lead at all, if you had been in that position?

Mr. Frazier. At that range, at that distance, 175 to 205 feet, with this rifle...
and that telescopic sight, I would not have allowed any lead—I would not have made any correction for lead merely to hit a target of that size.

Mr. McCloy. May I ask a question?

In your experimentation, in your firing of those shots that you have testified to a little while back, when you fired the first shot, was the shot in the chamber, or did you have to push it into the chamber by use of the bolt?

Mr. Frazier. This was fired with a loaded chamber, and timed from the time of this first shot until the last shot.

Mr. McCloy. Did you shoot offhand or did you shoot with a rest?

Mr. Frazier. We shot with a rest, both the other individuals and myself, on each occasion, with one arm resting on a bench or a table.

Mr. McCloy. Were you prone, or were you standing up?

Mr. Frazier. Well, we were sitting, actually, sitting or kneeling, in order to bring the arm down to the rest we were using.

Mr. McCloy. One other question.

You keep referring to, and the questions kept referring to, “lead.” By “lead,” in this instance, you would mean height above the aiming point rather than—

Mr. Frazier. Yes, sir.

Mr. McCloy. To the right, let’s say, of the aiming point?

Mr. Frazier. Yes, sir; that is correct.

Mr. McCloy. Because it was a going away shot?

Mr. Frazier. Yes, sir.

Mr. McCloy. That is all.

Representative Booher. May I ask a question?

Where did you conduct these tests?

Mr. Frazier. The targets were fired both on the indoor range in the FBI range here in Washington and the 100-yard tests were fired at the Quantico, Va., FBI ranges.

Representative Booher. Have any tests—have there been any simulated tests in the building in Texas?

Mr. Frazier. I don’t know, sir.

Representative Booher. But the FBI has not conducted any?

Mr. Frazier. Not to my knowledge. There may have been measurements and things of that nature taken, but I don’t know.

Representative Booher. Now, in these tests, was there any difficulty about firing this rifle three times within the space or period of time that has been given to the Commission—5 seconds, I think.

Mr. Frazier. Well, let me say this. I fired the rifle three times, in accordance with that system of timing it from the first shot with the chamber loaded until the last shot occurred—three times in 4.6 seconds, 4.8 seconds, 5.8 seconds, 5.5 seconds, and another one a little over 6, or in that neighborhood. The tenth of a second variation could very easily be as a result of the timing procedure used. A reflex of just not stopping the stopwatch in a tenth of a second.

Representative Booher. You were firing at a simulated target?

Mr. Frazier. These targets previously introduced, or copies of the targets, are those which we actually fired.

Representative Booher. My questions are really a followup of the Chairman’s question.

These practices—were you just practicing for time, or were you practicing under conditions similar to those existing in Dallas at the time of the assassination?

Mr. Frazier. The tests we ran were for the purposes of determining whether we could fire this gun accurately in a limited amount of time, and specifically to determine whether it could be fired accurately in 6 seconds.

Now, we assumed the 6 seconds empirically—that is, we had not been furnished with any particular time interval. Later we were furnished with a time interval of 5.5 seconds. However, I have no independent knowledge—had no independent knowledge of the time interval or the accuracy. But we merely fired it to demonstrate the results from rapidly firing the weapon, reloading the gun and so on, in a limited time.
Representative Booze. Were there other tests conducted to determine the accuracy of the weapon and so on?

Mr. Frazier. No, sir—I only the rapid-fire accuracy tests were fired by the FBI.

Representative Booze. There is no reason to believe that this weapon is not accurate, is there?

Mr. Frazier. It is a very accurate weapon. The targets we fired show that.

Representative Booze. That was the point I was trying to establish.

Mr. Frazier. This Exhibit 540 is a target fired, showing that the weapon will, even under rapid-fire conditions, group closely—that is, one shot with the next.

Representative Booze. How many shots in the weapon? Five?

Mr. McCloy. The clip takes six itself. You can put a seventh in the chamber. It could hold seven, in other words. But the clip is only a six-shot clip.

Representative Booze. Was the weapon fully loaded at the time of the assassination?

Mr. McCloy. I don’t know how many shells—three shells were picked up.

Mr. Eisenberg. Off the record.

(Discussion off the record.)

Mr. McCloy. Back on the record.

Mr. Eisenberg. Mr. Frazier, turning back to the scope, if the elevation crosshair was defective at the time of the assassination, in the same manner it is now, and no compensation was made for this defect, how would this have interacted with the amount of lead which needed to be given to the target?

Mr. Frazier. Well, may I say this first. I do not consider the crosshair as being defective, but only the adjusting mechanism does not have enough tolerance to bring the crosshair to the point of impact of the bullet. As to how that would affect the lead—the gun, when we first received it in the laboratory and fired these first targets, shot high and slightly to the right.

If you were shooting at a moving target from a high elevation, relatively high elevation, moving away from you, it would be necessary for you to shoot over that object in order for the bullet to strike your intended target, because the object during the flight of the bullet would move a certain distance.

The fact that the crosshairs are set high would actually compensate for any lead which had to be taken. So that if you aimed with this weapon as it actually was received at the laboratory, it would be necessary to take no lead whatsoever in order to hit the intended object. The scope would accomplish the lead for you.

I might also say that it also shot slightly to the right, which would tend to cause you to miss your target slightly to the right.

Mr. Eisenberg. Now on that last question—did you attempt to center the windage crosshair to sight-in the windage crosshair?

Mr. Frazier. We attempted to, and found that it was changing—the elevation was changing the windage. So we merely left the windage as it was.

Mr. Eisenberg. Can you say conclusively that the windage crosshair could not be centered in, sighted-in?

Mr. Frazier. No, sir. I would say that the windage could have been centered in the telescope to bring the windage to the aiming line.

Mr. Eisenberg. So that—and if that had been done, then you would not have this problem of dispersion to the right?

Mr. Frazier. That’s true.

Mr. Eisenberg. Now, turning to—

Representative Booze. Excuse me just a moment. Do you have any opinion on whether or not the sight was deliberately set that way?

Mr. Frazier. No, sir; I do not. And I think I must say here that this mount was loose on the rifle when we received it. And apparently the scope had been taken off of the rifle, in searching for fingerprints on the rifle. So that actually the way it was sighted-in when we got it does not necessarily mean it was sighted-in that way when it was abandoned.

Mr. Eisenberg. Carrying this question a little bit further on the deliberateness of the sighting-in, the problem with the elevation crosshair is built into the mounting of the scope, is that correct?

Mr. Frazier. Yes. The mount is not screwed to the rifle in such a fashion...
that it points the scope at the target closely enough to permit adjusting the crosshair to accurately sight in the rifle.

Representative Boose. One other question, then.
It is possible, isn't it, to so adjust the telescopic sight to compensate for that change in the target?

Mr. Frazier. Oh, yes. You can accomplish that merely by putting shims under the front of the scope and over the back of the scope to tip the scope in the mount itself, to bring it into alignment.

Representative Boose. So an accomplished person, accustomed to using that weapon, anticipating a shot of that type, might very well have made such an adjustment prior to using the rifle; isn't that so?

Mr. Frazier. If it were necessary; yes. There were no shims in the weapon, either under the mount, where it screws to the weapon, or in the two mounting rings, when we received it in the laboratory.

Mr. Eisenberg. Do you have any shims with you, Mr. Frazier?

Mr. Frazier. Yes. When we received the weapon yesterday, there were shims mounted in the rifle. The one under the front end of the mount is in this envelope.

Representative Boose. But they were not there when you received it originally?

Mr. Frazier. No, sir. These were placed there by some other individual.

Mr. Eisenberg. For the record, these were placed by the ballistics laboratory of the Army, a representative of which will testify later.

Now, turning to another possible source of error in aim, Mr. Frazier, if a rifle such as Exhibit 139 is sighted-in with the use of a target at a given distance and it is aimed at a target which is further away or closer than the target which was used for sighting-in purposes, will any error be introduced by reason of the fact that the target is further or closer away than the sighting-in target?

Mr. Frazier. Yes, it will, because the bullet in leaving the muzzle follows a curved path rather than a straight path, and in order to hit a specific target at a specific range, it is necessary for the bullet to travel up and drop down to the target, rather than have the bore pointed right at the target at the time of discharge.

Mr. Eisenberg. Can you calculate the amount of error which would be introduced by a specific projectile?

Mr. Frazier. Yes.

Mr. Eisenberg. Have you made such calculations?

Mr. Frazier. I have taken calculations for similar weight and velocity bullets from ballistics tables, which bullets approximate the velocity of the 6.5 mm. bullet and the weight of that bullet as fired from 139.

Mr. Eisenberg. Are these results affected by the rifle which is employed, or do they depend upon the missile?

Mr. Frazier. They depend upon the weight and shape of the missile and the velocity, but not upon the weapon.

Mr. Eisenberg. Could you give us the results of these calculations?

Mr. Frazier. Yes, sir; if you, for instance, take this rifle with a telescopic sight and sight it in for 300 feet—that is, the bullet will strike where you are looking when you are shooting at 300 feet—at 200 feet the bullet will be above the line of sight approximately one-quarter of an inch, and at 100 feet it will be approximately one-quarter of an inch below the line of sight. That is accomplished because the bullet is still coming up at 100 feet, it crosses the line of sight, and does not descend again to it until you come to the sighting-in distance of 300 feet.

If you sighted-in to strike at 450 feet, the bullet at 100 feet would be just at the line of sight—that is, on its way up would just cross the line of sight at about 100 feet. It would be one inch high at 200 feet, and approximately one and one-eighth inches high at 300 feet.

It would, of course, drop back down to the point of aim at 450 feet. If you sighted-in at 600 feet, then at 100 feet it would be approximately one-half inch high. At 200 feet it would be 2 inches high, and at 300 feet it would be approximately 3 inches high.
Representative Boose. Is this a stationary target?
Mr. Frazier. Yes, this is shooting from a rest at a stationary target.
Representative Boose. This is just a normal—
Mr. Frazier. This is just the trajectory of the bullet.
Representative Boose. I understand.
Mr. Frazier. As calculated—
Mr. McClint. Putting it another way, what would be the drop of the bullet at a hundred yards if you aim point-blank straight at that target?
Mr. Frazier. Assuming no sighting or anything, the bullet would drop about 1.2 inches from the line of the bore at 100 yards.
Representative Boose. 1.2 inches?
Mr. Frazier. Yes, sir.
Representative Boose. But now the telescopic sight at a hundred yards would correct that?
Mr. Frazier. Yes, sir. Actually, you would sight so that the muzzle is tipped up slightly with reference to the sight.
Mr. Eisenberg. The error would be introduced if you shot at a target which is closer or further away than the sighting-in target; is that correct?
Mr. Frazier. Yes, that’s right.
Mr. Eisenberg. Would you characterize these errors as material?
Mr. Frazier. No, sir; I would not—unless you began shooting at distances well beyond your sighting-in point—then the amount of variation increases very rapidly.
Mr. Eisenberg. What would be the usual minimum distance you use for sighting-in a weapon such as Exhibit 139?
Mr. Frazier. It would vary from place to place depending upon shooting conditions, and I would say it would seldom be sighted-in for less than 150 or 200 yards.
Mr. Eisenberg. So that if the shots involved in the assassination were fired at 175 feet and 265 feet respectively, they would be shorter than the sighting-in distance and therefore not materially affected by the trajectory characteristics, is that correct?
Mr. Frazier. That is correct, yes.
Mr. Eisenberg. Now, based upon the characteristics of Exhibit 139, and the ammunition it employs, and based upon your experience with the weapon, would you consider it to have been a good choice for the commission of a crime such as the assassination?
Mr. Frazier. Yes, sir; I would.
Mr. Eisenberg. Can you explain that?
Mr. Frazier. Yes. Any rifle, regardless of its caliber, would be a good choice if it would shoot accurately.
Mr. Eisenberg. And did you find this shot accurately?
Mr. Frazier. Yes, sir.
Representative Boose. Would you consider the shots difficult shots—talking about the shots from the sixth-floor window to the head of the President and to Governor Connally?
Mr. Frazier. No, sir; I would not under the circumstances—a relatively slow-moving target, and very short distance, and a telescopic sight.
Representative Boose. You are not answering that as an expert.
Mr. Frazier. From my own experience in shooting over the years, when you shoot at 175 feet or 265 feet, which is less than a hundred yards, with a telescopic sight, you should not have any difficulty in hitting your target.
Representative Boose. Putting my question another way, you would not have to be an expert marksman to accomplish this objective?
Mr. Frazier. I would say no, you certainly would not.
Representative Boose. And a man is a relatively large target, is he not?
Mr. Frazier. Yes, sir; I would say you would have to be very familiar with the weapon to fire it rapidly, and do this—hit this target at those ranges. But the marksmanship is accomplished by the telescopic sight. I mean it requires no training at all to shoot a weapon with a telescopic sight once you know that you must put the crosshairs on the target and that is all that is necessary.
Mr. Eisenberg. How does the recoil of this weapon compare with the recoil of the average military rifle?
Mr. Frazier. Considerably less. The recoil is nominal with this weapon, because it has a very low velocity and pressure, and just an average-size bullet weight.
Mr. Eisenberg. Would that trend to improve the shooter's marksmanship?
Mr. Frazier. Under rapid-fire conditions, yes.
Mr. Eisenberg. Would that make it a better choice than a more powerfully recoiling weapon for the type of crime which was committed?
Mr. Frazier. For shooting rapidly, this would be a much better choice, because the recoil does not throw the muzzle nearly so far off the target, it does not jar the shooter nearly so much, as a higher-powered rifle, such as a .30-06 or a .270 Winchester, or a German 8 mm. Mauser, for instance, or one of the other military-type weapons available.
Mr. Eisenberg. Is the killing power of the bullets essentially similar to the killing power at these ranges—the killing power of the rifles you have named?
Mr. Frazier. No, sir.
Mr. Eisenberg. How much difference is there?
Mr. Frazier. The higher velocity bullets of approximately the same weight would have more killing power. This has a low velocity, but has very adequate killing power with reference to humans, because it is a military—it is an established military weapon.
Representative Boozé. This is a military weapon, is it not?
Mr. Frazier. Yes, sir.
Mr. McCloy. That is designed to kill a human being.
Representative Boozé. Exactly.
Mr. Eisenberg. Unless there are further questions on the weapon, I am going to move into the area of the identification of the cartridge cases and the bullets.
Mr. McCloy. I may say I have to leave at twelve o'clock for a twelve-fifteen appointment. I will be back this afternoon.
Mr. Eisenberg. Mr. Frazier, returning to the cartridge cases which were marked earlier into evidence as Commission Exhibits 543, 544, and 545, and which, as I stated earlier for the record, had been found next to the window of the sixth floor of the Texas School Book Depository, can you tell us when you received those cartridge cases?
Mr. Frazier. Yes, sir; I received the first of the exhibits, 543 and 544, on November 23, 1963. They were delivered to me by Special Agent Vincent Drain of the Dallas FBI Office.
And the other one I received on November 27, 1963, which was delivered by Special Agents Vincent Drain and Warren DeBruyres of the Dallas Office.
Mr. Eisenberg. After receiving these cartridge cases, did you clean them up or in any way prepare them for examination?
Mr. Frazier. Yes. The bases were cleaned of a paint which was placed on them by the manufacturer. In spots this red lacquer on the base of the case was overlapping the head of the case where some of the microscopic marks were located, and some of that color was taken off.
Mr. Eisenberg. Why is that lacquer put on the cartridge cases?
Mr. Frazier. It seals the primer area against moisture.
Mr. Eisenberg. Were there any other changes made in the preparation of the cartridge cases?
Mr. Frazier. No, sir.
Mr. Eisenberg. You have examined the cartridge cases previously. Are they in the same condition now that they were when you received them in the laboratory except for the cleaning of the lacquer?
Mr. Frazier. Yes, sir; they are.
Mr. Eisenberg. After receiving the cartridge cases, did you examine them to determine whether they had been fired in Commission Exhibit 133?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. When did you make the examinations?
Mr. Frazier. On the dates I mentioned, that is, November 23, 1963, and November 27, 1963.
Mr. Eisenberg. And what were your conclusions, Mr. Frazier?

Mr. Frazier. I found all three of the cartridge cases had been fired in this particular weapon.

Mr. Eisenberg. Can you describe the examination which you conducted to reach these conclusions?

Mr. Frazier. The first step was to fire test cartridge cases in this rifle to pick up the microscopic marks which are left on all cartridge cases fired in this weapon by the face of the bolt. Then those test cartridge cases were mounted on a comparison microscope, on the right-hand side, and on the left-hand side of the comparison microscope was mounted one of the three submitted cartridge cases, so that you could magnify the surfaces of the test and the evidence and compare the marks left on the cartridge cases by the bolt face and the firing pin of the rifle.

(At this point, Mr. McCloy left the hearing room.)

Mr. Eisenberg. I now hand you two cartridge cases, and ask you whether you can identify these cartridge cases?

Mr. Frazier. Yes, sir; these are the two cartridge cases we fired for test purposes in Exhibit 139.

Mr. Eisenberg. Do they have your mark on them?

Mr. Frazier. Yes, they do.

Mr. Eisenberg. Commissioner Boggs, may I introduce these as 557?

Representative Boggs. They may be admitted.

(The items referred to were marked Commission Exhibit No. 557 for identification and received in evidence.)

Mr. Eisenberg. These were the only two cartridge cases fired as tests in Exhibit 139—as tests for the purpose of identification of the cartridge cases which you examined before, 543, 544, and 545?

Mr. Frazier. Yes, sir; these two were used in those tests. There were many other cartridge cases fired, but not for that purpose.

Mr. Eisenberg. Can you explain how you are able to come to a conclusion that a cartridge case was fired in a particular weapon to the exclusion of all other weapons?

Mr. Frazier. Yes, sir; during the manufacture of a weapon, there are certain things done to the mechanism of it, which are by machine or by filing, by grinding, which form the parts of the weapon into their final shape. These machining and grinding and filing operations will mark the metal with very fine scratches or turning marks and grinding marks in such a way that there will be developed on the surface of the metal a characteristic pattern. This pattern, because it is made by these accidental machine-type operations, will be characteristic of that particular weapon, and will not be reproduced on separate weapons. It may be a combination of marks that—the face of the bolt may be milled, then it may be in part filed to smooth off the corners, and then, as a final operation, it may be polished, or otherwise adjusted during the hand fitting operation, so that it does have its particular pattern of microscopic marks.

The bolt face of the 139 rifle I have photographed and enlarged in this photograph to show the types of marks I was referring to.

Mr. Eisenberg. You took this photograph yourself, and it is a photograph of the bolt face of the 139 rifle?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. May I have this introduced as 558?

Representative Boggs. It may be admitted.

(The photograph referred to was marked Commission Exhibit No. 558, and received in evidence.)

Mr. Eisenberg. What is the magnification of this bolt-face photograph?

Mr. Frazier. Approximately 31 diameters.

Mr. Eisenberg. Could you slip out the bolt of the rifle so we could see how it compares, and show us the part of the bolt which is photographed?

Mr. Frazier. Orienting the photograph with the writing at the bottom, orients the bolt also, as it comes out of the rifle—with the slot shown as a groove on the
bottom of the bolt. Then the extractor on the bolt, is the area shown at the left side of the photograph, as you view it—the actual bolt face itself is inset into the bolt below the surface of the extractor, and a supporting shoulder around it, and in the center, of course, is the firing-pin hole and the firing pin.

The marks produced during manufacture are the marks seen on the bolt face; filing marks, machining marks of the various types, even forging marks or casting marks if the bolt happens to be forged or cast. And then variations which occur in these marks during the life of the weapon are very important in identification, because many of the machining marks can be flattened out, can be changed, by merely a grain of sand between the face of the cartridge case and the bolt at the time a shot is fired, which will itself scratch and dent the bolt face. So the bolt face will pick up a characteristic pattern of marks which are peculiar to it.

The same is true of extractors and ejectors. They are in turn machined and will have a pattern of marks or scratches on their surfaces which will mark cartridge cases in the same manner each time.

The comparison we made was of the marks appearing in this photograph, 556, in fairly close proximity to the firing pin hole, since that is the area that the primer in the head of the cartridge case comes in contact with.

The primer in a cartridge case normally takes marks more readily than the surrounding brass portion of the cartridge case, which is a considerably harder metal and is not impressed with these marks as readily.

The three cartridge cases, 553, 554, and 555, were compared——
Mr. Engenber. Is that 543, 544, and 545?
Mr. Frazier. I am sorry—yes, 543, 544, and 545. These three cartridge cases were placed one at a time on the comparison microscope, and the surfaces having the breech-face marks or the bolt marks were compared with those on the test cartridge cases, Exhibit 557. As a result of comparing the pattern of microscopic markings on the test cartridge cases and those marks on Exhibits 543, 544, and 545, both of the face of the bolt and the firing pin, I concluded that these three had been fired in this particular weapon.

Representative Boos. Who manufactured these cartridges?
Mr. Frazier. Western Cartridge Co., East Alton, Ill.

Representative Boos. They manufacture cartridges and bullets for all manner of rifles?
Mr. Frazier. Yes, they do.

Representative Boos. This is not—this rifle is not common in the United States, is it?
Mr. Frazier. It is fairly common now, but at the time it was manufactured or used primarily it was not. It was imported into this country as surplus military equipment, and has been advertised quite widely.

Representative Boos. These three cartridges—these three shells that you had were the same as the live ones that were found there, were they not?
Mr. Frazier. There was one live cartridge found. They are identical.

Representative Boos. And the live one was manufactured also by——
Mr. Frazier. Yes, the Western Cartridge Co. It bears the head stamp "WCO" and "8.5 mm."

Representative Boos. These are not difficult to obtain? You can buy them anywhere?
Mr. Frazier. Well, you can buy them from mail-order houses primarily, or a few gun shops that have accumulated a supply by ordering them. The information we have is that two million rounds were imported into the United States in one lot, one shipment—and they have been transmitted over the country and are for sale by several different surplus gun shops—used guns—mail-order houses and places of that nature—and gunsmiths, and firearms shops sell this ammunition.

Representative Boos. Go ahead.
Mr. Engenber. Mr. Frazier, what is the basis of the statement you made earlier that no two bolt faces would be the same?
Mr. Frazier. Because the marks which are placed on any bolt face are accidental in nature. That is, they are not placed there intentionally in the first place. They are residual to some machining operation, such as a milling machine, in which each cutter of the milling tool cuts away a portion of the metal; then the next tooth comes along and cuts away a little more, and so on, until the final surface bears the combination of the various teeth of the milling cutter. In following that operation, then, the surface is additionally scratched—until you have numerous—we call them microscopic characteristics, a characteristic being a mark which is peculiar to a certain place on the bolt face, and of a certain shape, it is of a certain size, it has a certain contour, it may be a little dimple in the metal, or a spot of rust at one time on the face of the bolt, or have occurred from some accidental means such as dropping the bolt, or repeated use having flattened or smoothed off the surface of the metal.

Mr. Eisenberg. Why doesn't a series of the same machines, or repeated use of the same machines, cause the same results, apart from future accidental markings?

Mr. Frazier. In some instances a certain type of cutter will duplicate a certain pattern of marks. In general you will find for a milling cutter a circular mark. And you may find the same pattern of circles. But that milling cutter does not actually cut the steel; it tears it out, it chips it out, and the surface of the metal then is rough—even though the circle is there, the circle is not a smooth circle, but it is a result of tearing out the metal, and you will have a very rough surface. When magnified sufficiently, you can detect the difference even between two similarly milled surfaces because of the minor variations in the cutting operation.

Mr. Eisenberg. Have you had occasion to examine such similarly-milled surfaces?

Mr. Frazier. Oh, yes; many times.

Mr. Eisenberg. Would you go into detail on that?

Mr. Frazier. Well, part of my work in the laboratory is dealing with toolmarks of all types, from drills, mills, files, cutting instruments, and so on. And when you are dealing with filing marks or milling marks and so on, it is sometimes possible to identify a particular mill as having made a certain mark on the basis of the grinding marks on that particular mill. But such as a case like this, where the cutting marks have now been altered through use of the weapon and corrosion, or in wear or in filing, some of the original marks are removed, and other marks are in their place, until eventually you reach a condition where that bolt face will be entirely different from any other bolt face. It is a matter actually—when you get down to the basis of it, it is a matter of a mathematical impossibility in the realm of human experience for any two things to ever be exactly alike.

Mr. Eisenberg. That is because the original markings will not be exactly alike, and then you have added accidental markings on top of the original ones?

Mr. Frazier. That is right; yes, sir.

Mr. Eisenberg. Returning for a moment to the original markings, as I understand it, you have worked with the tools themselves and the impressions the tools themselves leave, as opposed to a tooled surface, such as this.

Mr. Frazier. I have worked with both. In other words, in comparing toolmarks, you examine not only the tool, but the marks they produce.

Mr. Eisenberg. And in working with these tools, as I understand your testimony, you have found that the markings which a tool leaves, which the same tool leaves, will be distinctive.

Mr. Frazier. That is true, yes. When it is a scrape or an impression from its surface, or something of that nature, it can be very readily identified. But if it is a drill or something of that nature, where you have a tearing operation, then it is not readily identified, but it occasionally can be identified.

Mr. Eisenberg. Well, how many such examinations do you think you have made?

Mr. Frazier. Thousands of them.

Mr. Eisenberg. Have you noticed whether the marks left by a given tool—that you have examined—change over the course of the use of the tool?
Mr. Frazier. Yes, they change very rapidly when a tool is used to cut a hard object.

Mr. Eisenberg. Could you elaborate on what you mean by “very rapidly”?

Mr. Frazier. Well, for instance, when using a pry bar, for example, one insertion of a pry bar into the hard insulation of a safe, with pressure applied to it can change the entire blade of the tool to the extent that you could not identify a succession of marks, because of the abrasion by the insulation. But that same tool, used to mark a soft steel or brass or copper, could make mark after mark without changing, or only a small portion of it may change with each impression. Or it may gradually change over a period of time.

Mr. Eisenberg. Now, is the metal in the bolt face a hard metal or a soft metal?

Mr. Frazier. I would say it was hard metal.

Mr. Eisenberg. With reference to copper or other softer metals—it is a steel. I could not say how hard it actually is.

Mr. Eisenberg. What will the effect of the metal used in the bolt face be upon the tool which is used to finish it off, cut it and finish it off?

Mr. Frazier. The tool will gradually wear out.

Mr. Eisenberg. Well, will the tool leave different marks on the end of the bolt face from one bolt to the very next bolt face?

Mr. Frazier. Oh, yes; that very often happens. The tool is worn out or the small cuttings get underneath the edge, between the tool, and nick the edge of the tool, so that the tool will gradually change over a period of time. The cutting edge—the amount of change depends upon the amount of wear, the heat involved, and the hardness of the metal—the relative hardness of the metal.

Mr. Eisenberg. Will that particular change be noticed invariably in two consecutive bolt faces?

Mr. Frazier. No, sir.

Mr. Eisenberg. So what is the genesis of the difference in the two consecutive bolt faces as they come from the manufacturer?

Mr. Frazier. The change, as I said, depends on the bolt you are using. It does not always take place, because some bolts are made of a very soft metal, and they will not necessarily change a machining tool to that extent.

Mr. Eisenberg. But the markings, you said, would be different on two consecutive bolt faces?

Mr. Frazier. Oh, yes.

Mr. Eisenberg. And if the tool is not changed, what is the origin of the difference between the markings?

Mr. Frazier. There are other accidental markings placed there during the machining operation.

Mr. Eisenberg. Could you describe that?

Mr. Frazier. For instance, as the blade of a milling machine travels around a surface, it takes off actually a dust—it is not actually a piece of metal—it scrapes a little steel off in the form of a dust—or a very fine powder or chip—that tooth leaves a certain pattern of marks—that edge. That milling cutter may have a dozen of these edges on its surface, and each one takes a little more. Gradually you wear the metal down, you tear it out actually until you are at the proper depth. Those little pieces of metal, as they are traveling around, can also scratch the face of the bolt—unless they are washed away. So that you may have accidental marks from that source, just in the machining operation.

Now, there are two types of marks produced in a cutting operation. One, from the nicks along the cutting edge of the tool, which are produced by a circular, operating tool—which produce very fine scratches in a circular pattern. Each time the tool goes around, it erases those marks that were there before. And when the tool is finally lifted out, you have a series of marks which go around the surface which has been machined, and you will find that that pattern of marks, as this tool goes around, will change. In one area, it will be one set of marks—and as you visually examine the surface of the metal, these very
fine marks will extend for a short distance, then disappear, and a new mark
of a new type will begin and extend for a short distance. The entire surface,
then, will have—be composed of a series of circles, but the individual marks
seen in the microscope will not be circular, will not form complete circles
around the face of the bolt.

Mr. Eisenberg. Have you had occasion to examine two consecutive bolt
faces from a factory?

Mr. Frazier. Oh, yes.

Mr. Eisenberg. And what did you find on that examination?

Mr. Frazier. There would be no similarity in the individual microscopic
characteristics between the two bolt faces.

Mr. Eisenberg. There actually was none?

Mr. Frazier. No, there was none.

Mr. Eisenberg. In the bolt face with which we are dealing, Exhibit 139, can
you say from inspection whether the markings on that bolt face are pre-
dominantly the accidental markings introduced subsequent to manufacture,
or the markings of the manufacture?

Mr. Frazier. I would say that these were filing marks for the most part
which were made during manufacture, some of which have been obliterated and
changed through use—possibly corrosion.

Mr. Eisenberg. Mr. Frazier, taking Exhibit 543, did you prepare a photo-
graph of this exhibit?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Compared with the test cartridge case?

Mr. Frazier. Yes, sir; this is the photograph, showing the test cartridge
case from Exhibit 557 on the right and the cartridge case 543 on the left.

Mr. Eisenberg. This was prepared by you or under your supervision?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Mr. Chairman?

Representative Boose. It may be admitted.

(The item referred to was marked Commission Exhibit No. 559 and received
in evidence.)

Mr. Eisenberg. Now, that is marked on the left C-14, and on the right,
C-6.

Mr. Frazier. Yes, sir.

Mr. Eisenberg. And the left-hand photograph is a photograph of what?

Mr. Frazier. Of the cartridge case 543.

Mr. Eisenberg. That is the actual fired case?

Mr. Frazier. Yes, sir; it shows just a portion of the primer, and a very
small portion of the firing-pin impression.

Mr. Eisenberg. And the right-hand side of that photograph, marked C-6?

Mr. Frazier. It is a test cartridge case, fired in the rifle Exhibit 139.

Mr. Eisenberg. What is the magnification, Mr. Frazier?

Mr. Frazier. Approximately 100 diameters.

Mr. Eisenberg. And is that magnification equal on both sides of the picture?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Did you make your identification of Exhibit 543, that is the
identification of that exhibit as having been fired in the rifle 139, on the basis
of your examination under the microscope, or on the basis of the photograph?

Mr. Frazier. Under the microscope. The photograph has no relationship
whateomer to the examination.

Mr. Eisenberg. Can you explain that?

Mr. Frazier. The examination is made microscopically through the use
of your eyes, and your eyes will record depths and shapes to a much greater
extent than can be shown in a photograph. So that the examination and
comparison is made of these irregular surfaces mentally, rather than me-
chanically by any means. The photograph is taken primarily to illustrate
the types of marks found and their location, relatively, on the specimen.

Representative Boose. We will have to adjourn and come back at 2.
(Whereupon, at 12:15 p.m., the President’s Commission recessed.)
Afternoon Session

TESTIMONY OF ROBERT A. FRAZIER RESUMED

The President's Commission reconvened at 2:10 p.m.
Mr. McCoy. You are still under oath, you know.
Mr. Frazier. Yes, sir.
Mr. Eisenberg. I would like to begin by clearing up a few items which have been covered or left open during the morning session.

First, you were going to supply us with certain figures concerning the times which were taken by two of the Agents to fire three shots in the first series of tests which were made for determining the accuracy of the firing under rapid-fire conditions.

Mr. Frazier. Yes, sir; that was at two targets. The first one I gave you—Killion fired in 9 seconds. The other was a target marked Cunningham and Frazier. Cunningham fired his three shots in 8 seconds and I fired my three shots in 5.9 seconds.

Mr. Eisenberg. Now also you had made certain calculations concerning what we have been calling the lead that had to be given to a target, assuming various factors which were supplied to you. Do you have those calculations now?

Mr. Frazier. Yes, sir: the lead would amount to shooting over the target at 175 feet, a distance of 6.7 inches, and the decimal on that figure is not an accurate decimal because this figure relates to an average velocity of ammunition of this type, and it is concerned with a speed of a vehicle which is also estimated, and a distance which may or may not be exactly accurate.

But at a ground speed of 11 miles an hour, it would be necessary to shoot over or lead a target 6.7 inches for the bullet to hit the intended spot on the target. At 250 feet the lead would be 17 feet, or 51 inches.

I might say that the variation, that of less lead at the longer distance, is in great part due to the fact that the target is farther away and that the shot is more nearly in line with the direction in which the target is moving, which would account for much of the drop in the amount of lead.

And, in addition, I calculated this on the basis of the fact that there was a slight slope between the 175-foot and the 255-foot location downwards away from the shooter, which would also tend to more nearly cause the target to be moving in the same path as the bullet.

Mr. Eisenberg. And did you convert those lead distances into the amount of inches which the shooter would have to sight above the head, above the point of the target?

Mr. Frazier. Those figures I gave were the elevations or the sighting distances above the target. The 6.7 inches vertical lead or sighting over the target is the equivalent of leading on the ground of 1.4 feet.

Mr. Eisenberg. And that table also shows leads at other car speeds?

Mr. Frazier. This table—I could calculate them—it only shows miles per hour translated into feet per second.

Mr. Eisenberg. I mean, does it show various miles per hour?

Mr. Frazier. Yes; it shows miles per hour in feet per second.

Mr. Eisenberg. Without going into detail at this time, may I have permission to introduce this table into evidence?

Mr. McCoy. It may be admitted.

Mr. Eisenberg. This will be Commission Exhibit 500.

(The item identified as Commission Exhibit No. 500 was received in evidence.)

Mr. Eisenberg. Now, Mr. Frazier, in the construction of this table and also in your last tests for rapid fire for this rifle, you used a five-and-a-half second figure as a factor in your calculations, and in your attempt at rapid fire accuracy placements. Can you give us the source of that figure?

Mr. Frazier. Yes, sir. You were the source of it, based on examination, as I understood it, of a movie taken at the scene, and measurements taken at the scene. However, I have no knowledge of the actual time.

Mr. Eisenberg. For the record, I just wanted to establish that this is a
source that was supplied by the Commission and which is tentative, and it is not to imply any final conclusion on the part of the FBI; is that correct?

Mr. Frazier. I hope it is taken that way, because we don’t know what the time actually was.

Mr. Eisenberg. Another point then, which should have been covered this morning, Mr. Frazier, in your qualifications; have you testified before in court?

Mr. Frazier. Yes; I have.

Mr. Eisenberg. Can you estimate the number of times?

Mr. Frazier. Approximately 400 times.

Mr. Eisenberg. Finally, we had discussed briefly your examination of consecutively manufactured bolt faces to see whether any two such consecutively manufactured bolt faces were identical in their microscopic characteristics. How many such examinations have you performed?

Mr. Frazier. I would say about four examinations of pairs of bolt faces which have been consecutively manufactured.

Mr. Eisenberg. And in each case the result was what?

Mr. Frazier. The marks on one bolt face in no way resembled the marks on the other bolt face.

Mr. Eisenberg. Mr. Frazier, we were just beginning to discuss, before the recess, Commission Exhibit 559, which is a picture, as you described it, of Exhibit No. 548 and a test cartridge under a microscope, and that is also known as C-6 and C-14, is that right?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Could you discuss, by using that picture, some of the markings which you have seen under the microscope and on the basis of which you made your identification?

Mr. Frazier. Yes, sir. In the photograph I have drawn some small circles and numbered them, those circles, correspondingly on each side of the photograph. The purpose of the circles is not to point out all the similarities, but to call attention to some of them and to help orient in locating a mark on one with a mark on the opposite side of the photograph. In general the area shown is immediately outside of the firing pin in the bolt of the 139 rifle, on the left side of the photograph, and Commission Exhibit 548 on the right side.

The circles have been drawn around the dents or irregularly shaped ridges, small bumps, and depressions on the surface of the metal in six places on each side of the photograph. It is an examination of these marks, and all of the marks on the face of the breech, microscopically which permits a conclusion to be reached. The photograph itself actually is a substitute to show only the type of marks found rather than their nature, that is, their height, their width, or their relationship to each other, which is actually a mental, visual, comparison on the two specimens themselves.

Mr. Eisenberg. Referring for a second to this mental, visual, comparison, Mr. Frazier, would a person without firearms training—firearms-identification training—be able to look under a microscope and make a determination for himself concerning whether a given cartridge case had been fired in a given weapon?

Mr. Frazier. In that connection that person could look through the microscope, he may or may not see these individual characteristics which are present, because he does not know what to look for in the first place, and, secondly, they are of such a nature that you have to mentally sort them out in your mind going back and forth between one area and the other until you form a mental picture of them in a comparison such as this.

If it was a different type of comparison, of parallel marks or something of that nature, then he could see the marks, but in either instance, without having compared hundreds and hundreds of specimens, he would not be able to make any statement as to whether or not they were fired from the same rifle.

Mr. Eisenberg. Would you say that this is, then, a matter of expert interpretation rather than a point-for-point comparison which a layman could make?

Mr. Frazier. I would say so; yes. I don’t think a layman would recognize some of the things on these cartridge cases and some shown in the photographs as actually being significant or not significant, because there will be things
present which have nothing whatsoever to do with the firing of the cartridge case in the gun.

There may be a depression in the primer to begin with, and there are no marks registered at that point as a result of the firing. Unless these things are known to occur, someone may actually arrive at a different conclusion, because of the absence of similar marks.

Mr. Eisenberg. Now having reference to the specific exhibit before you, which is 559—

Mr. Frazier. Yes.

Mr. Eisenberg. Are all the marks shown in both photographs identical?

Mr. Frazier. No.

Mr. Eisenberg. And could you go into detail on a mark which is not identical to explain why you would get such a result?

Mr. Frazier. Well, for instance, between what I have drawn here as circle 4 and circle 5, there is a slanting line from the upper left to the lower right on C-6. This line shows as a white line in the photograph.

On the other side there is a rough, very rough ridge which runs through there, having an entirely different appearance from the relatively sharp line on C-6. The significant part of that mark is the groove in between, rather than the sharp edge of the mark, because the sharp corner could be affected by the hardness of the metal or the irregular surface of the primer and the amount of pressure exerted against it, pressing it back against the face of the bolt, at the time the cartridges were fired. So that you would never expect all the marks on one cartridge case to be identical with all the marks on the other cartridge case.

In fact, you would expect many differences. But the comparison is made on the overall pattern, contour, and nature of the marks that are present.

Mr. Eisenberg. Off the record.

(Discussion off the record.)

Mr. Eisenberg. Back on the record.

Mr. Frazier, could you discuss or characterize those points which you have circled on Commission Exhibit 559, starting from the top?

Mr. Frazier. Number 1 circle is drawn around a depression in the metal of irregular shape. I might say that number 1 shows on the right side of the photograph, and only half of it shows on the left side because of the relative position of the two cartridge cases in the photograph.

Number 2 is a circle drawn around a long line which extends obliquely across each cartridge case from the upper left to the lower right. The long line itself is a means of orienting the cartridge cases one with the other, but the circle is drawn around a break in that line in the form of a very small bump or an absence of metal which shows up as an actual break in the long line.

Number 3 again is a depression between two grooves, which is rather similar in shape. I cannot tell you how deep it is because the photograph only shows two dimensions. But on the cartridge cases it has a very characteristic depth to it, which is readily apparent.

It is formed by two parallel lines extending from the upper left to the lower, towards the lower right, with the depression in between, and again one side of the depression is formed by a small raised area in the primer metal which is seen in each photograph as a conical, almost a conical-shaped bump or raised area.

Number 4 is another raised portion on the photograph. In connection with 4, I would like to point out that a portion of this bump has been erased from the test cartridge case on the left-hand side of the photograph, the erasure caused by the turning of the bolt of the weapon while being pressed against the primer, which has smoothed off some of the protruding rough areas on the primer.

Number 5 is a horizontal ridge which has two depressions, one on the top and one on the bottom, shown on both sides of the photograph, and number 6 is a wishbone type of ridge, a wide ridge which divides into two smaller ridges on the left-hand edge, and in the middle of the dividing lines, the forked lines, is a small dent or raised portion. Those six which I have marked are only portions of those shown in the photograph, and of course the photograph does not show the entire surface of the primer.
Mr. Eisenberg. Were you able to find identifying marks on the brass as well as the primer on this cartridge case?

Mr. Frazier. No; I did not notice any marks on the brass portions outside of the primer.

Mr. Eisenberg. Is that typical of cartridge-case identification?

Mr. Frazier. Generally that is true, unless there is a great pressure, unless the brass of the cartridge case is soft, or unless the marks are very sharp on the breech face; then they will be impressed into the brass.

Mr. Eisenberg. This picture represents only a portion of the primer. You examined the entire primer to make your identification?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. And found?

Mr. Frazier. It would not have been necessary to examine the entire primer necessarily, but of course we do examine the entire primer, pick out all of the marks on the left and the right, and rotate the cartridge cases and look at them from various angles, before arriving at a conclusion.

Mr. Eisenberg. Can you amplify the meaning of the statement that it would not be necessary to examine the entire primer?

Mr. Frazier. There are sufficient marks shown in this photograph upon which to base an identification. In other words, it would not be necessary to have the rest of the primer if it had been mutilated or destroyed or something of that nature.

Mr. Eisenberg. Did you also examine the firing-pin impression in the cartridge?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Did you take a picture of that examination?

Mr. Frazier. Yes. Here is the photograph of the firing-pin impression, again on the left the rifle, and on the right the cartridge case, Commission's 563.

Mr. Eisenberg. That bears the number C-14 and C-6, corresponding to the numbers on Commission Exhibit 569?

Mr. Frazier. Yes; it does.

Mr. Eisenberg. Did you take this photograph or have it taken under your supervision?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. What is the magnification of this photograph?

Mr. Frazier. 90 diameters.

Mr. Eisenberg. Is it equal on both sides?

Mr. Frazier. Yes.

Mr. Eisenberg. Mr. Chairman, may I have this admitted?

Mr. McCoy. It may be admitted.

Mr. Eisenberg. That will be 561.

(The item identified as Commission Exhibit No. 561 was received in evidence.)

Mr. Eisenberg. Could you proceed with the discussion of the circled marks on this photograph, number 561?

Mr. Frazier. In the case of firing-pin impressions which are shown on Exhibit 561, the marks result from two related causes; excuse me, not causes, but from two related causes, one being the force given to the firing pin driving it into the primer to set off the cartridge, and the second being the force of the powder charge inside the cartridge being driven back—driving the primer back against the firing pin at the same time, so that the metal of the primer is caused to flow or be stamped by the firing pin and pressed against by the gases, so that any irregularities in the firing pin will be impressed into the primer of the cartridge case.

Number 1 consists of a double horizontal line, one a fairly wide coarse line at the top. Immediately under that approximately one-eighth of an inch is a fairly fine horizontal line.

Circled and marked number 2 is a very coarse, wide ridge, very short in length, approximately one-half an inch, and an eighth to a quarter of an inch
in height. This ridge is formed by two grooves, a straight groove across the top, and a curved or crescent-shaped groove across the bottom.

Number 3 is a circle drawn around two small raised areas in the primer metal separated by a depression.

Number 4 is a section from a large ridge across the metal of the primer, which has a break in its surface in the lower portion of the circle, and immediately above the break is a groove, and immediately above that again is another ridge which is at a little steeper angle upwards to the left.

Number 5 is a depression, is a portion of a depression appearing at the bottom of the circle with a very short ridge running horizontally across the circle.

Mr. Eisenberg. Again there are dissimilar marks on these two pictures, Mr. Frazier?

Mr. Frazier. Yes; there are, for the same reason, that metal does not flow the same in every instance, and it will not be impressed to the same depth and to the same amount, depending on the type of metal, the blow that is struck, and the pressures involved.

Mr. Eisenberg. Is your identification made therefore on the basis of the presence of similarities, as opposed to the absence of dissimilarities?

Mr. Frazier. No, that is not exactly right. The identification is made on the presence of sufficient individual microscopic characteristics so that a very definite pattern is formed and visualized on the two surfaces.

Dissimilarities may or may not be present, depending on whether there have been changes to the firing pin through use or wear, whether the metal flows are the same, and whether the pressures are the same or not.

So I don't think we can say that it is an absence of dissimilarities, but rather the presence of similarities.

Mr. Eisenberg. Any further questions on this cartridge case?

Mr. McCloy. No.

Mr. Eisenberg. Mr. Frazier, you have testified also that you identified the cartridge case which is Exhibit 544 as having been fired from this rifle, in this rifle, to the exclusion of all others. Did you take a photograph of the comparison that you made under the microscope of number 544?

Mr. Frazier. Yes. I again took two photographs, one of the breech-face or bolt-face marks, and one of the firing-pin marks.

Mr. Eisenberg. This exhibit which I am holding is a picture of the breech-face marks?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. And was that taken by you or under your supervision?

Mr. Frazier. Yes, sir; it was.

Mr. Eisenberg. And the magnification here is what?

Mr. Frazier. 90 diameters.

Mr. Eisenberg. May I have this admitted, Mr. Chairman?

Mr. McCloy. It may be admitted.

Mr. Eisenberg. That will be number 562, Mr. Reporter.

(The item described as Commission Exhibit No. 562 was received in evidence.)

Mr. Eisenberg. Could you discuss the markings on this picture, Mr. Frazier?

Mr. Frazier. Yes, sir. In Commission Exhibit 562, there is again the vertical dividing line which is the top of the prism in the microscope which divides your view. On the left hand side is a portion of the primer and a portion of the head of the test cartridge case from Exhibit 130. On the right side of the photograph is a portion of the surface of the primer and a portion of the firing-pin impression of the cartridge case, Commission Exhibit 544.

To assist in pointing out on the photograph some of the areas where individual microscopic characteristics are present, I have had circles drawn, circling at the top, number 1, an oval-shaped depression in the metal, having an irregularly shaped or wavy ridge across the bottom of the circle. Immediately below that is another ridge which has a flat top, and is more or less of a diamond shape.

Number 3 circle is over a very coarse, wide ridge separated by two fairly deep grooves on each side.

Number 4 circle is over a conical-shaped raised portion on the primer which
represents a dent in the metal of the bolt face, and number 5 again is a raised area on the primer which is a portion of a ridge. In this instance this is more or less of a compound ridge which runs horizontally with a small break in it pointing down toward the lower left.

Mr. McCloy. Is that same break apparent in the left hand photograph?

Mr. Frazier. Yes, sir; it is. Looking very closely and right at the hairline, you can see the break in the ridge where it forms more or less of a Y. The actual connecting point is not present, but you can see the portion of the ridge as it heads towards the horizontal ridge. The hairline has separated that portion of it.

Mr. Eisenberg. Would you call these marks strongly characteristic marks, Mr. Frazier?

Mr. Frazier. Oh, yes; very characteristic. They are primarily characteristic because of their irregular shape. If they had been regular in shape, it wouldn’t have meant nearly as much as it does to have the irregular rough surfaces and contours of the marks.

Mr. Eisenberg. I think you have identified the next picture I am holding as having been taken by you?

Mr. Frazier. Yes, sir; it was. That is a 70-diameter magnification photograph of Exhibit 544 on the right, and the test from the rifle on the left.

Mr. Eisenberg. And this bears the numbers C-14 and C-7, and is a firing-pin photograph?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. May this firing-pin mark photograph be admitted, Mr. Chairman?

Mr. McCloy. It may be admitted.

Mr. Eisenberg. That is 563.

(The item was numbered 563, and was received in evidence.)

Mr. Eisenberg. Could you review that photograph, Mr. Frazier?

Mr. Frazier. Yes, sir. In Exhibit 563 the test cartridge case representing the rifle is on the left side of the photograph, and shows most of the firing-pin impression in that cartridge case. The five circles have been drawn over towards the right-hand edge of the firing-pin impression, and five similarly located circles have been drawn over the area at the right-hand edge of the firing-pin impression of Exhibit 544.

Mr. Eisenberg. Which is actually the left-hand side of the right-hand part of the picture?

Mr. Frazier. It would be—that is right; at the dividing line, the circles on 544 are drawn close to the dividing line, which shows only a very small portion of the firing pin of that cartridge case.

Beginning with number 1, it has a gently sloping ridge running from upper left toward lower right in each instance, with a break in the ridge contour at the middle in the form of an extension upwards toward the top of the photograph.

In number 2 there is a circle drawn around the end of a very long line in the left-hand side of the photograph. The circle is drawn to show a Y-shaped break in this line located on both cartridge cases.

Number 3 is a photograph of an irregular-shaped raised portion on the firing-pin impression, which is very difficult to describe in words.

Number 4 is a groove extending from upper right to lower left which has a break in its lower side to allow a horizontal groove to come in towards the main groove. The lower portion of that groove coming in from the lower side is in the form of a crescent-shaped ridge, which starts horizontally from the left and then falls off towards the lower right-hand side of the photograph.

The circle, number 5, is again a Y-shaped or wishbone-shaped ridge, with a horizontal bar on the right, and then extending ridges upward to the left and downward to the left.

Mr. Eisenberg. Again, are these firing-pin marks what you would call strongly characteristic?

Mr. Frazier. Yes; I would say so.

Mr. Eisenberg. Does the firing pin give any evidence of having been altered subsequent to the original manufacture?

Mr. Frazier. No, sir; only in an accidental sort of way, that is, very fine

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scratches which may have been caused by firing or dirt on a cartridge or something which may have scratched the firing pin.

Mr. Eisenberg. Are firing-pin marks usually as characteristic of a given cartridge case as the primer marks?

Mr. Frazier. Yes, sir; I would say they are as characteristic. However, they may not always be as evident, they may not be seen as readily. However, they are just as characteristic.

Mr. McCloy. Just to repeat again, what is this side of this picture? What does this represent?

Mr. Frazier. That represents the rifle cartridge.

Mr. McCloy. The rifle cartridge itself?

Mr. Frazier. Yes, sir.

Mr. McCloy. And this one on the right?

Mr. Frazier. This is one of the three cartridge cases recovered from the building. Exhibit 544.

Mr. Eisenberg. Mr. Frazier, you fired two test cartridges in the rifle, is that correct?

Mr. Frazier. We fired several test cartridge cases. These two are the ones that were used in the comparisons.

Mr. Eisenberg. Did you fire several for possible comparison purposes, or only two for possible comparison purposes?

Mr. Frazier. Those we fired were in the time-fire test and we retained some of those for possible use in comparing, but it was not necessary to use them, actually.

Mr. Eisenberg. Did you use both of these test cartridge cases in the photographs, or only one of them?

Mr. Frazier. I could not tell by these photographs. We did not make any distinction when we were comparing tests with the evidence as to which test cartridge case we were using.

Mr. Eisenberg. When you made your selection among cartridge cases to select the items which would be used as test cases for comparison purposes, were the items you rejected much different from those you selected?

Mr. Frazier. No. The marks were generally the same on all of them. Those we used in this comparison were two tests which we fired on November 23rd and used them in our tests—made our examination, our identification.

Later on we fired accuracy tests and speed tests and retained some of those cartridge cases, but they were not necessarily retained for test purposes, for identification of the weapon, but merely as a result of the other tests that were made.

Mr. Eisenberg. Could you just as easily have used other of the items from your original November twenty—

Mr. Frazier. Oh, yes; yes.

Mr. Eisenberg. Getting to the last cartridge case, Exhibit 545, did you take a photograph of the exhibit together with the test case under the microscope after making your identification?

Mr. Frazier. Yes; I did. This photograph shows that cartridge case 545 on the right, and the test cartridge case from the rifle, 138, on the left.

Mr. Eisenberg. This is marked on the right C-38 and on the left C-14?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Again this is a photograph taken by you or under your supervision?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. And that is of the primer?

Mr. Frazier. Yes; it is.

Mr. Eisenberg. And you have a second photograph here also, marked C-14 and C-38, also taken by you or under your supervision?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. And this is of the markings of the firing pin?

Mr. Frazier. Yes; it is.

Mr. Eisenberg. Can you give us the magnification first of the primer-markings photograph?

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Mr. Frazier. That is 100 diameters enlargement on the primer, and on the firing-pin it is 80 diameters.

Mr. Eisenberg. Now in all the cases of the photographs you have given us, the magnifications are equal on both sides, are they?

Mr. Frazier. Yes; they are.

Mr. Eisenberg. Mr. Chairman, may I have these admitted into evidence?

Mr. McCloy. They may be admitted.

Mr. Eisenberg. They will be 564 and 565.

(The items, identified as Commission Exhibits Nos. 564 and 565, were received in evidence.)

Mr. Eisenberg. Could you discuss the photograph, Exhibit 564 please, Mr. Frazier?

Mr. Frazier. Exhibit 564 is again, a portion of the primer of the cartridge case fired by me in the rifle number 139 appearing on the left side of the vertical dividing line through the center of the photograph, and on the right side a portion of the surface of the cartridge case, Exhibit 566, showing its primer and the marks on it.

In the photograph four circles, or portions of circles, have been drawn, circling some of the areas where individual microscopic characteristics are found which permitted identifying the two cartridge cases as having been fired in the same weapon.

In the upper circle are again two ridges separated by a groove, the lower right-hand end of which is blocked by a raised portion in the metal of the primer.

Circle number 2 is again a depression bounded on the top by a long sloping groove, sloping from the upper left subsequently to the lower right.

In circle number 3 there is a series of ridges running horizontally across the photograph. The lowest of these three ridges is a rather wide round-topped ridge.

Circle number 4 shows the left-hand side of a figure which you could roughly call a Z in the primer, which consists of a horizontal or nearly horizontal line running from left to right which meets a second line running from right down to the left, which again meets a third line which runs from the left to the right. This is shown in both photographs as the three lines which form the shape of a Z on the primer.

Mr. Eisenberg. Mr. Frazier, on this photograph there is shown a mark at approximately 3 o'clock on the left-hand side of the picture, and 9 o'clock on the right-hand side, and the marks seem to be different in the two pictures, being broader on the left-hand, C-14, than on the right, C-38. Could you explain the genesis of the difference? It seems to extend further down.

Mr. Frazier. Approximately in the center of the photograph where the two images meet, there is a scraped area which is the result of the surface of the metal of the bolt scraping the surface of the primer as the bolt was turned in opening the bolt to extract the cartridge.

On the test cartridge case, this area is much broader and coarser because the bolt was pressing more tightly against the primer when it was turned. On the evidence cartridge case, the marks are relatively fine, separated, and even show portions of the surface of the primer in between the circular marks left by the rotating bolt. The reason is that this primer was not being pressed as tightly against the bolt at the time it was turned.

Mr. Eisenberg. Would that be due to differences in the construction of the cartridge—the two cartridges?

Mr. Frazier. It could be differences in the cartridge, but primarily it would be a difference in the amount of setback of the cartridge against the bolt at the time it was fired.

If a cartridge is slightly away from the bolt when it is fired, the primer is blown back out of the cartridge. As the pressure builds up, the cartridge then moves back and reseats the primer in the primer pocket. The manner in which that movement of the primer out and back in is accomplished determines how tightly the primer will bear against the face of the breach after the cartridge has been fired.
It could be that, and it could be just a slight difference in the hardness of the metal of the primer which caused this one to flow back more and be marked more.

Mr. EISENBERG. Could you discuss Exhibit No. 585?

Mr. FRAZIER. Yes, sir; in Commission Exhibit No. 585 is shown the firing-pin impressions of the test cartridge case from the 139 rifle on the left and the cartridge case, 545, on the right, with a dividing line through the middle separating the primer of one cartridge case from the primer of the other.

No circles have been drawn around this photograph because the marks shown are marks of an abraded area on the firing pin, and are more or less parallel and formed parallel patterns, so that the eye can follow from one line across to the opposite side of the photograph.

In this area shown of the firing pin of the weapon, there was a small scraped area which left these microscopic ridges and grooves shown on the left photograph, and also reproduced in the 545 primer or firing-pin impression on the right side of the photograph.

Mr. McCLOY. State for me again what is on the left side? What is this C-14?

Mr. FRAZIER. This is the rifle cartridge case, the test cartridge case.

Mr. McCLOY. The test rifle?

Mr. FRAZIER. Yes; the cartridge case which I fired in 139.

Mr. McCLOY. In 139. And the one on the right?

Mr. FRAZIER. This the cartridge case from the building, Exhibit 545.

Mr. McCLOY. Which was found in the building?

Mr. FRAZIER. Found in the building.

Mr. McCLOY. On all of these on the left is it always the same—

Mr. FRAZIER. Yes, sir; on all of the photographs we have discussed so far.

Mr. McCLOY. I just wanted to make that clear.

Mr. EISENBERG. Mr. Frazier, it appears to the eye that only a portion of this is in focus. Is that correct?

Mr. FRAZIER. Only a portion of the entire photograph is in focus, yes, and that is the area where these individual marks appear, occur.

Mr. EISENBERG. Can you explain?

Mr. FRAZIER. Yes, sir; the reason being the outer area, the area up to the edge of the firing-pin impression is considerably higher, and the microscope does not have the depth of focus to focus on a very deep groove or depression such as the firing pin at the bottom of it and still maintain the top in focus.

The firing pin is circular, I should say, hemispherical in shape, so that it leaves a cup-shaped impression of it—only one portion of it can be in focus at the same time; the other part being either higher or lower will be out of focus.

Mr. EISENBERG. Mr. Frazier, I now hand you Commission Exhibit 398, which, for the record, is a bullet, and also for the record, it is a bullet which was found in the Parkland Hospital following the assassination. Are you familiar with this exhibit?

Mr. FRAZIER. Yes, sir. This is a bullet which was delivered to me in the FBI laboratory on November 22, 1963 by Special Agent Elmer Todd of the FBI Washington Field Office.

Mr. EISENBERG. Does that have your mark on it?

Mr. FRAZIER. Yes, it does.

Mr. EISENBERG. The bullet is in the same condition as it was when you received it?

Mr. FRAZIER. Yes, sir; except for the marking of my initials and the other examiners. There is a discoloration at the nose caused apparently by mounting this bullet in some material which stained it, which was not present when received, and one more thing on the nose is a small dent or scraped area. At this area the spectographic examiner removed a small quantity of metal for analysis.

Mr. EISENBERG. Did you prepare the bullet in any way for examination? That is, did you clean it or in any way alter it?

Mr. FRAZIER. No, sir; it was not necessary. The bullet was clean and it was not necessary to change it in any way.
Mr. Eisenberg. There was no blood or similar material on the bullet when you received it?

Mr. Frazier. Not any which would interfere with the examination, no, sir.

Now there may have been slight traces which could have been removed just in ordinary handling, but it wasn't necessary to actually clean blood or tissue off of the bullet.

Mr. Eisenberg. Did you examine this exhibit to determine whether it had been fired in Exhibit 139?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. And what was your conclusion?

Mr. Frazier. It was... Exhibit 139 was fired in the rifle 139.

Mr. Eisenberg. That is in the exclusion of all other rifles?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Can you describe the types of markings which are generated onto a bullet, as opposed to those which are generated onto a cartridge case?

Mr. Frazier. A bullet when it is fired picks up the marks of the barrel of the weapon. These marks consist of rifling marks of the lands and the grooves, the spiral grooves in the barrel, and, in addition, the abrasion marks or rubbing marks which the bullet picks up due to the friction between the barrel and the surface of the copper jacket on the bullet, or if it is a lead bullet, with the lead.

Mr. McCloy. You said the marks of the groove. You mean the marks of the groove or the marks of the lands?

Mr. Frazier. Both, sir; both are present. In this barrel there are four lands and four grooves. Each of the raised portions in the barrel will be impressed into the surface of the bullet causing four—we call them land impressions—on the bullet, and, in between, four groove impressions.

Mr. Eisenberg. How are you able to conclude that a given bullet was fired in a given weapon to the exclusion of all other weapons, Mr. Frazier?

Mr. Frazier. That is based again upon the microscopic marks left on the fired bullets and those marks in turn are based upon the barrel from which the bullets are fired.

The marks in the barrel originate during manufacture. They originate through use of the gun, through accidental marks resulting from cleaning, excessive cleaning, of the weapon, or faulty cleaning. They result from corrosion in the barrel due to the hot gases and possibly corrosive primer mixtures in the cartridges used, and primarily again they result from wear, that is an eroding of the barrel through friction due to the firing of cartridges, bullets through it.

In this particular barrel the manufacturer's marks are caused by the drill which drills out the barrel, leaving certain marks from the drilling tool. Then portions of these marks are erased by a rifling tool which cuts the four spiral grooves in the barrel and, in turn, leaves marks themselves, and in connection with those marks of course, the drilling marks, being circular in shape, there is a tearing away of the surface of the metal, so that a microscopically rough surface is left.

Then removing part of those marks with a separate tool causes that barrel to assume an individual characteristic, a character all of its own.

In other words, at that time you could identify a bullet fired from that barrel as having been fired from the barrel to the exclusion of all other barrels, because there is no system whatever to the drilling of the barrel. The only system is in the rifling or in the cutting of the grooves, and in this case of rifle barrels, even the cutters wear down as the barrels are made, eventually of course having to be discarded or re-sharpened.

Mr. Eisenberg. Have you examined consecutively manufactured barrels to determine whether their microscopic characteristics are identical?

Mr. Frazier. Yes, sir; I have three different sets of, you might say, paired barrels, which have been manufactured on the same machine, one after the other, under controlled conditions to make them as nearly alike as possible, and in each case fired bullets from those barrels could not be identified with each other; in fact, they looked nothing at all alike as far as individual micro-
scopical characteristics are concerned. Their rifling impressions of course would be identical, but the individual marks there would be entirely different.

Mr. Eisenberg. Mr. Frazier, did you determine the weight of the exhibit—that is, 399?

Mr. Frazier. Yes, sir. Exhibit 399 weighs 158.6 grains.

Mr. Eisenberg. How much weight loss does that show from the original bullet weight?

Mr. Frazier. We measured several standard bullets, and their weights varied, which is a normal situation; a portion of a grain, or two grains, from 161 grains—that is, they were all in the vicinity of 161 grains. One weighed—160.5, 161.5, 161.1 grains.

Mr. Eisenberg. In your opinion, was there any weight loss?

Mr. Frazier. There did not necessarily have to be any weight loss to the bullet. There may be a slight amount of lead missing from the base of the bullet, since it is exposed at the base, and the bullet is slightly flattened; there could be a slight weight loss from the end of the bullet, but it would not amount to more than 4 grains, because 158.6 is only a grain and a half less than the normal weight, and at least a 2-grain variation would be allowed. So it would be approximately 3 or 4 grains.

Mr. Eisenberg. Were the markings on the bullet at all defaced?

Mr. Frazier. Yes; they were, in that the bullet is distorted by having been slightly flattened or twisted.

Mr. Eisenberg. How material would you call that defacement?

Mr. Frazier. It is hardly visible unless you look at the base of the bullet and notice it is not round.

Mr. Eisenberg. How far does it affect your examination for purposes of identification?

Mr. Frazier. It had no effect on it at all.

Mr. Eisenberg. Can you explain why?

Mr. Frazier. Because it did not mutilate or distort the original microscopic marks beyond the point where you could recognize the pattern and find the same pattern of marks on one bullet as were present on the other.

Mr. Eisenberg. Did you take a photograph of your comparison of Exhibit 399 with a test bullet?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. This photograph was prepared by you or under your supervision?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Can you tell us the magnification?

Mr. Frazier. 70 diameters.

Mr. Eisenberg. And this reads C-14 on the left and C-1 on the right?

Mr. Frazier. Yes; it does.

Mr. Eisenberg. Mr. Chairman, may I have that admitted?

Mr. McCloy. The one on the right is the cartridge that you just——

Mr. Frazier. Yes. 396, yes, sir.

Mr. McCloy. 396?

Mr. Frazier. And the one on the left is the test bullet.

Mr. McCloy. The test. It may be admitted.

Mr. Eisenberg. That will be 596, Mr. Reporter.

(The item so described was identified as Commission Exhibit No. 596 and received in evidence.)

Mr. Eisenberg. Mr. Frazier, could you discuss photograph 596?

Mr. Frazier. This exhibit shows on the left side of a dividing vertical line representing the top of the prism in the microscope which was used for the comparison, a portion of the surface from the test bullet from the rifle, 139, and on the right side of the photograph a portion of the surface of the bullet, 399.

The marks shown in the photograph are on an area representing approximately one-half of one groove impression in the barrel of the weapon, which extends from approximately 2 inches up from the bottom of the photograph, being the edge of one land impression, and the beginning of a groove impression up to the top of the photograph, that area being approximately one-half or possibly two-thirds of a groove impression.
The microscopic marks which were used in the identification, after being observed through the microscope and making the comparison and the identification, were photographed, and this photograph shows a portion of the surface of that bullet, showing parallel lines extending from the left side of the photograph coming up to the hairline and continuing across on the right side of the photograph, these microscopic marks being very fine grooves and ridges on the surface of the bullet, very coarse ridges on the surface of the bullet, and in between size scratches left on the bullet by the barrel of the weapon.

There will be some marks which will not show up on one bullet which show up on the other bullet, and similarly some marks on the other bullet, in this case Exhibit 300, will not be present on the test bullet, that situation being due to a number of causes.

One, the bullets could have originally been slightly different in diameter, the larger bullet, of course, picking up more marks during its passage through the barrel.

Secondly, the two bullets may not have expanded exactly the same, due to the pressure of the powder behind them as they passed through the barrel.

Third, with each bullet fired through the barrel, there are certain changes that occur due to the wearing away of the surface of the metal of the barrel, so that after a series of shots through a particular barrel, it would be expected that the pattern of microscopic marks produced by it would change.

The identification is based on areas such as this on the bullet and the comparison of the microscopic marks around the entire surface of the bullet which bears individual characteristics.

Mr. Eisenberg. Mr. Frazier, running through the middle of the exhibit there seem to be finer lines on the right-hand side than on the left. Could you explain that, the reason why the lines come out with more detail or that there are more lines on the right side than on the left?

Mr. Frazier. Those marks could be the result of the bullet striking some object after it was fired, or they could be the result of changes having taken place in the barrel.

For instance, even a piece of coarse cloth, leather or some other object could have polished the surface of the metal slightly and left infinitesimal scratches which, when enlarged sufficiently, actually look like marks on the bullet.

Mr. Eisenberg. In making your examination of the bullet, what was the relative attention you gave to the broader lines we see in this picture and the finer lines such as those we have just been referring to?

Mr. Frazier. The broader lines would be more characteristic or they are looked for most, because they change less rapidly than the fine lines. For instance, firing two or three bullets through a barrel could completely erase microscopic marks which would appear as fine lines in a certain area, whereas the coarser lines and grooves on the bullet would be maintained over a series of fired bullets.

Mr. Eisenberg. In evaluating these lines, do you examine the lines individually, or are you interested in their relationship with one another in addition?

Mr. Frazier. It is a combination. You actually examine each mark and each line individually, but it is a mental process rather than a matter of adding one line to another. It is a process of looking at a series of lines and you actually notice that they are composed of round-topped ridges, V-topped ridges, flat-topped ridges, and it is a mental process of looking at the whole pattern rather than the individual marks.

Mr. Eisenberg. All these lines that we are looking at lie within a groove, within one groove, did you say?

Mr. Frazier. Yes; except for the lower portion of the photograph, there is a portion of a land impression showing one rather deep groove running across the bottom of the picture, and a series of grooves shown next to the edge of the land impression.

Mr. Eisenberg. Will you identify the circular-looking mark on the right-hand side of the picture?

Mr. Frazier. That could be either a flaw in the bullet, the metal itself, before it was fired, or could be the result of the bullet having struck some object after
it was fired and before it stopped, or as it stopped, or could be the result of
having been dropped or roughly handled.

This particular mark there would be invisible practically speaking to the
naked eye when looking at the bullet.

Mr. McCloy. The mark to which you refer is the one on the right-hand side
of the exhibit toward the top, about an inch and a half from the center line?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Is that about 11 o'clock?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Do you have another photograph, Mr. Frazier, of this?

Mr. Frazier. No, sir.

Mr. Eisenberg. I now hand you a bullet fragment, what appears to be a bullet
fragment, in a pill box which is labeled Jacket and Lead Q-2, and it has certain
initials on it. For the record, this was found—this bullet fragment was found—in
the front portion of the car in which the President was riding. I ask you
whether you are familiar with this object.

Mr. Frazier. Yes; I am.

Mr. Eisenberg. Is your mark on it?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Did you examine this? Is this a bullet fragment, Mr.
Frazier?

Mr. Frazier. Yes, sir. This consists of a piece of the jacket portion of a
bullet from the nose area and a piece of the lead core from under the jacket.

Mr. Eisenberg. How were you able to conclude it is part of the nose area?

Mr. Frazier. Because of the rifling marks which extend part way up the
side, and then have the characteristic leading edge impressions and no longer
continue along the bullet, and by the fact that the bullet has a rounded contour
to it which has not been mutilated.

Mr. Eisenberg. Did you examine this bullet to determine whether it had
been fired from Exhibit 139 to the exclusion of all other weapons?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. What was your conclusion?

Mr. Frazier. This bullet fragment was fired in this rifle, 139.

Mr. Eisenberg. Mr. Frazier, did you weigh this fragment?

Mr. Frazier. Yes; I did. It weighs 44.8 grains.

Mr. Eisenberg. Did you take a photograph of the fragment as compared
with a test bullet?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. This photograph is labeled C-14 on the left and C-2 on the
right, and it is a photograph taken by you or under your supervision?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. C-14 being the test bullet?

Mr. Frazier. The test bullet from 139.

Mr. Eisenberg. And what is the magnification of this photograph?

Mr. Frazier. It would be 70 diameters.

Mr. Eisenberg. Mr. Chairman, may that be admitted?

Mr. McCloy. C-2 is the actual fragment?

Mr. Eisenberg. Yes.

Mr. McCloy. It may be admitted.

Mr. Eisenberg. Can we go back a second? I don't think I asked for admission
of the bullet fragment which Mr. Frazier identified. May I have that
admitted?

Mr. McCloy. It may be admitted.

Mr. Eisenberg. The bullet fragment will be 567 and the photograph just
identified by Mr. Frazier will be 568.

Mr. McCloy. It may be admitted.

(The items described, identified as Commission Exhibits Nos. 567 and 568, were
received in evidence.)

Mr. Eisenberg. Mr. Frazier, could you discuss this photograph with us?

Mr. Frazier. In Commission Exhibit 568 is again the vertical dividing line
through the center of the photograph, with the test bullet from the rifle 139
on the left, and the bullet, Exhibit 567, on the right. Am I right in that the bullet jacket fragment is 567?

Mr. Eisenberg. I think I put it down here. That is right, 567.

Mr. Frazier. Approximately two-thirds of a groove impression from each of the two bullets is shown, with a very small portion at the bottom of the photograph of a land impression. The individual microscopic characteristics which were used in the comparison, and on which the identification was made, were photographed and are as shown in this photograph. However, this photograph did not enter into the actual conclusion reached. The microscopic characteristics appear as parallel horizontal lines extending from the test bullet on the left to the bullet Exhibit 567 on the right.

The marks used in the identification are grooves, paired lines, a series of ridges up and down the hairline on one bullet, and they also appear on the opposite side of the photograph.

In one particular instance it will be seen that at the edge of the land impression at the lower left portion of the photograph is a very definite paired ridge which appears on the right side of the photograph but in a slightly different area.

The reason for the difference in the location of this paired line on the exhibit, Exhibit 567, can be explained by the fact that this is a jacket fragment, that it was torn from the rest of the bullet, and is greatly mutilated, distorted, and bears only a very few areas suitable for identification purposes because of that fact.

The distortion has foreshortened the area of the jacket fragment, 567, to the extent that over this approximately one-tenth-of-an-inch surface represented in this photograph, these lines do not coincide exactly on the lower part of the photograph when they are lined up on the upper part of the photograph.

Mr. Eisenberg. When you say they don't correspond exactly, do you mean at all, or do you mean they aren't—

Mr. Frazier. I mean that the marks are present, but they do not line up at the hairline.

Mr. Eisenberg. But in your opinion the marks on the left are the same as the marks on the right?

Mr. Frazier. The marks on the left are the same marks as those on the right. In the examination this is easily determined by rotating the two bullets. As you rotate them, you can see these characteristic patterns line up.

Then you will notice these do not line up. But as you rotate one bullet, you can follow the individual marks mentally and see that the same pattern is present and you can line them up in your mind, even though they are not actually physically lined up in the microscope.

Mr. McCloy. They are not lined up in the microscope because there is mutilation on the fragment?

Mr. Eisenberg. Yes, sir.

Mr. McCloy. And there is no mutilation on the test cartridge?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Mr. Frazier, in the lower portion of each side of that photograph, which I take it is the groove of the bullet, or the land impression of the rifle—is that correct?

Mr. Frazier. The land on the rifle leaves this groove on the bullet.

Mr. Eisenberg. Yes; the right-hand side seems to be slightly striated while the left-hand side does not seem to be striated. Can you explain that?

Mr. Frazier. Well, the striae in this side are not apparent in this photograph. I don't know whether they actually exist on the bullet or not. You can't tell from the photograph, because they are so fine as to possibly not show at all.

A close examination right at the hairline shows a whole series of very fine scratches which do not appear further away from the hairline, and that could be very easily due to differences in the metal, as the bullet passed down the barrel, being pressed less forcibly against the barrel, or could also be due to the fact that at the edges of the lands it is very often evident that hot gases from the burning powder had passed the bullet through these cracks and actually will melt or erode away the surface of the bullet.
As to why they may or may not be present is difficult to say from an examination of the photograph.

Mr. Eisenberg. What portion of the bullet fragment provided enough markings for purposes of identification, approximately?

Mr. Frazier. I would say that one-fourth, in this instance, one-fourth of 537's surface was available. One-fifth to one-sixth would have been sufficient for identification, based on the character of the marks present.

Mr. Eisenberg. Now this portion of the fragment was an even smaller portion of the bullet, the entire bullet, is that correct?

Mr. Frazier. Yes; it was.

Mr. Eisenberg. So when you say one-fifth and one-sixth, are you referring now to the proportion of marks on the fragment, as opposed to the proportion of marks you would want from an entire bullet?

Mr. Frazier. No; I am referring to the proportion of marks on the fragment which were used in the examination as compared to the total bullet circumference which would have existed on an uncut bullet.

Mr. Eisenberg. Mr. Frazier, do you feel that the amount of markings here were sufficient to make positive identification?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Have you made identifications in the past with as few or less markings as are present on this bullet fragment?

Mr. Frazier. Oh, yes; and on less, much less of an area. The character of the marks is more important than the number of the marks.

Mr. Eisenberg. Mr. Frazier, here you were of course unable to see all of the lines which were present on the bullet before mutilation. Have you ever had an occasion where you examined a bullet and saw one portion of it which was an apparent match and then found out that the balance of the bullet was not an apparent match?

Mr. Frazier. No, sir; and if I understand your words "apparent match," there is no such thing as an apparent match. It either is an identification or it isn't, and until you have made up your mind, you don't have an apparent match. We don't actually use that term in the FBI. Unless you have sufficient marks for an identification, you cannot say one way or the other as to whether or not two bullets were fired from a particular barrel.

In other words, you cannot nonidentify on the absence of similarities any more than you can identify when you have no similarities present.

Mr. Eisenberg. In other words, you won't make an identification unless you feel enough marks are present to constitute a basis for a positive identification?

Mr. Frazier. That is right, and I would not report any type of similarities unless they were sufficient for an identification, because unless you can say one bullet was fired from the same barrel as a second bullet, then there is room for error, and in this field of firearms identification, we try to avoid any possible chance of error creeping in.

Mr. Eisenberg. Do you avoid the category of "probable" identification?

Mr. Frazier. Oh, yes; we never use it, never.

Mr. Eisenberg. And why is that?

Mr. Frazier. There is no such thing as a probable identification. It either is or isn't as far as we are concerned.

Mr. Eisenberg. And in this case it is?

Mr. Frazier. It is, yes.

Mr. Eisenberg. Any further questions on this bullet fragment, Mr. Chairman?

Mr. McCloy. Do we have any proof in the record thus far as to where the fragment referred to a moment ago came from?

Mr. Eisenberg. Honestly, I am not sure. I know it will be in the record eventually, but I have not taken that up as part of this testimony.

Mr. McCloy. That will be subject to further proof.

Mr. Eisenberg. Yes.

Mr. McCloy. If it is not in the record. As a result of all these comparisons, you would say that the evidence is indisputable that the three shells that were identified by you were fired from that rifle?
Mr. Frazier. Yes, sir.
Mr. McCloy. And you would say the same thing of Commission Exhibit 399, the bullet 399 was fired from that rifle?
Mr. Frazier. Yes, sir.
Mr. McCloy. And the fragment 567—
Mr. Frazier. 567, the one we have just finished.
Mr. McCloy. Was likewise a portion of a bullet fired from that rifle?
Mr. Frazier. Yes, sir.
Mr. McCloy. You have no doubt about any of those?
Mr. Frazier. None whatsoever.
Mr. Eisenberg. Now finally in the category of bullets and bullet fragments, I hand you what is apparently a bullet fragment, which is in a pill box marked Q-3, and which, I state for the record, was also found in the front portion of the President's car, and I ask you whether you are familiar with this item, marked Q-3?
Mr. Frazier. Yes, sir; this was submitted to me as having been found beside the front seat of the automobile.
Mr. Eisenberg. Your mark is on that fragment?
Mr. Frazier. Yes, it is.
Mr. Eisenberg. When did you receive that fragment, Mr. Frazier?
Mr. Frazier. At 11:30 p.m., November 22, 1968, from Special Agent Orrin Bartlett, our Haisan agent with the Secret Service, in the FBI laboratory.
Mr. Eisenberg. And the last bullet fragment you examined, Exhibit 567, when did you receive that?
Mr. Frazier. It was received at the same time from Special Agent Bartlett.
Mr. Eisenberg. Did you examine both at that time, Mr. Frazier?
Mr. Frazier. Yes, sir; beginning the following morning, November 23.
Mr. Eisenberg. Mr. Chairman, may I have this bullet fragment marked Q-3 admitted as Commission 569?
Mr. McCloy. It may be admitted.
(The item, identified as Commission Exhibit No. 569, was received in evidence.)
Mr. Eisenberg. Mr. Frazier, did you examine this bullet fragment with a view to determining whether it had been fired from the rifle, Exhibit 139?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. What was your conclusion?
Mr. Frazier. This bullet fragment, Exhibit 569, was fired from this particular rifle, 139.
Mr. Eisenberg. Again to the exclusion of all other rifles?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. Did you weigh this fragment, Mr. Frazier?
Mr. Frazier. Yes, I did. It weighs 21.0 grains.
Mr. Eisenberg. Can you describe the fragment?
Mr. Frazier. Yes. It consists of the base or most rearward portion of the jacket of a metal-jacketed bullet, from which the lead core is missing.
Mr. Frazier. It has the shape which bases of bullets have. It has the cannelure which is located at the rear, on the portion of bullets of this type.
Mr. Eisenberg. Can you determine whether this bullet fragment, 567, and 569 are portions of the same bullet?
Mr. Frazier. No, sir.
Mr. Eisenberg. You cannot?
Mr. Frazier. There is not enough of the two fragments in unmutilated condition to determine whether or not the fragments actually fit together.
However, it was determined that there is no area on one fragment, such as 567, which would overlap a corresponding area on the base section of 569, so that they could be parts of one bullet, and then, of course, they could be parts of separate bullets.
Mr. Eisenberg. Now 569 is without the core; is that correct?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. Could you estimate how much weight you would add if you had the core?
Mr. Frazier. No, I cannot.
Mr. Eisenberg. Not at all?
Mr. Frazier. No. I do not have the figure on the core weight.
Mr. Eisenberg. In your opinion, is it possible that if you did make such an estimate, the weight, the projected weight of 569 plus the actual weight of 567 would exceed the bullet weight of the 6.5 mm. bullet?
Mr. Frazier. Oh, no; it would not.
Mr. Eisenberg. It would not?
Mr. Frazier. It would not come even close to it, because the amount of core is only—one-quarter inch of the bullet is all that remains at the base, and that much core would not weigh more than 40 grains at the most.
Mr. Eisenberg. No cannelure shows on 567, is that correct?
Mr. Frazier. That is correct.
Mr. Eisenberg. Mr. Frazier, did you make a comparison photograph of 569 with a test bullet?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. This photograph is marked C-14 on the left and C-3 on the right; is that correct?
Mr. Frazier. Yes, it is.
Mr. Eisenberg. C-14 being the test?
Mr. Frazier. Yes, from the rifle 189, and C-3 is Exhibit 569.
Mr. Eisenberg. And the magnification on this photograph is what, Mr. Frazier?
Mr. Frazier. 70 diameters.
Mr. Eisenberg. And this was taken by you or under your supervision?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. Mr. Chairman, may I have this admitted?
Mr. McCloy. It may be admitted.
Mr. Eisenberg. 570.
(The item was identified as Commission Exhibit No. 570 and was received in evidence.)
Mr. Eisenberg. Can you discuss this picture?
Mr. Frazier. Commission Exhibit 570 shows a portion of the test bullet from Exhibit 189 on the left side of the photograph, and a portion of the bullet 569 on the right side, divided by a hairline.
The photograph was taken of the microscopic marks, examined through the comparison microscope, consisting of very fine and very coarse grooves, or scratches, or ridges, on the surface of each of the bullets as compared with those on the other bullet.
The photograph did not, of course, enter into the conclusion reached in the examination, but was merely taken to demonstrate, to illustrate the types of marks present insofar as a photograph can show them.
Mr. Eisenberg. Mr. Frazier, what portion of the Exhibit 569 was unmitigated enough to allow you to make a comparison of its markings?
Mr. Frazier. Approximately one-third. Actually, the entire base section of the bullet was present, but approximately one-half of that base was mutilated. On the mutilated area, either marks were destroyed completely by striking some object, or being compressed or stretched, or they were thrown out of relationship with each other by stretching or compressing to the extent that they were of no value.
So I would estimate approximately one-third of the area was present.
Mr. Eisenberg. Now, when you say one-third, is this total area or circumference?
Mr. Frazier. Circumference—one-third of the circumference.
Mr. Eisenberg. Do you have any further pictures of any of the bullets, Mr. Frazier?
Mr. Frazier. No, I do not.
Mr. Eisenberg. Mr. Frazier, I hand you two bullets and ask whether you are familiar with them.
Mr. Frazier. Yes, I am. These are the two test bullets which I fired from this rifle, Exhibit 139.

Mr. Eisenberg. Do they have your mark on them?

Mr. Frazier. Yes, they do.

Mr. Eisenberg. Mr. Chairman, may I have these admitted as Exhibit 572?

Mr. McCloy. They may be admitted.

(The document referred to was marked Commission Exhibit No. 572, and received in evidence.)

Mr. Eisenberg. Getting back to the two bullet fragments mentioned, Mr. Frazier, did you alter them in any way after they had been received in the laboratory, by way of cleaning or otherwise?

Mr. Frazier. No, sir; there was a very slight residue of blood or some other material adhering, but it did not interfere with the examination. It was wiped off to clean up the bullet for examination, but it actually would not have been necessary.

Mr. Eisenberg. Is that true on both fragments?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. You also mentioned there was blood or some other substance on the bullet marked 399. Is this an off-hand determination, or was there a test to determine what the substance was?

Mr. Frazier. No, there was no test made of the materials.

Mr. Eisenberg. As you examined the bullet and the two bullet fragments, are they in the same condition now as they were when they entered your hands?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. One other question on the cartridge cases.

Did you examine the cartridge cases for chambering marks, extraction marks, or ejection marks?

Mr. Frazier. Yes, I did, but I did not make any comparisons of either extractor or ejector marks or chambering marks, since the purpose of my examination was primarily to determine whether they were fired in this rifle, and such marks would not have assisted in that determination. They were not necessary because they would have indicated only that it may have been loaded into and extracted from the weapon, whereas the marks which I found served to identify it as having been fired in the weapon, actually.

Mr. Eisenberg. Mr. Chairman, unless you have further questions on the cartridge cases or bullets, I would like to move on to another subject.

Mr. McCloy. From your examination of the actual bullets that you have been told were fired on the day of the assassination from this rifle, and from your—how many separate bullets do you identify?

Mr. Frazier. Two, at the maximum—possibly three, if these two jacket fragments came from different bullets. If they came from one bullet, then there would be a maximum of the whole bullet 399 and this bullet in two parts.

Mr. McCloy. And you cannot tell whether these two particles came from one bullet or two separate ones?

Mr. Frazier. No, sir.

Mr. Eisenberg. When you say "two at the maximum," do you mean two at the minimum?

Mr. Frazier. I meant at least two bullets.

Mr. McCloy. There were at least two different bullets?

Mr. Frazier. At least two, yes.

Mr. Eisenberg. Mr. Frazier, can you give an estimate of the total number of bullets fired in the various tests made with this rifle?

Mr. Frazier. Approximately 60 rounds.

Mr. Eisenberg. And were all of these rounds 6.5 mm. Western Mannlicher-Carcano ammunition?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Did you have any misfires?

Mr. Frazier. No, sir.

Mr. Eisenberg. Did you find the ammunition dependable?

Mr. Frazier. Very dependable.

Mr. Eisenberg. Can you think of any reason why someone might think this is an undependable type of ammunition?
Mr. FRAZIER. No, sir; the Western Cartridge Co. has always manufactured, in my experience, very dependable ammunition. There is other ammunition on the market available for this particular rifle in this caliber, which in my opinion is undependable or would be a very poor quality of ammunition. It may have been a confusion between that other ammunition of the same caliber and this Western ammunition.

Mr. EISENHBERG. Can you elaborate as to what that other ammunition consists of?

Mr. FRAZIER. Certain companies have imported into the United States cartridges of foreign manufacture. Those I have seen for this rifle were of Italian manufacture. They have pulled the military bullets from those cartridges and reloading hunting type or soft-point bullets into the cartridges. In doing that, they did not, apparently, take any great pains in loading them. Occasionally, the month of the case would be bent over and the bullet driven in right on top of the bent case.

I have seen split cartridge cases, even before they were fired, badly corroded cartridge cases. All in all, the ammunition is of generally poor overall appearance, and it has been reported to me that it was of poor firing quality.

I have not fired any of it, personally.

Mr. EISENHBERG. Have you heard anything about the dependability of the Italian-made ammunition, unloaded?

Mr. FRAZIER. No, sir; not as such.

However, I have experienced the examination of Italian ammunition of various years of manufacture and, of course, various makes. And I think it is rather poor quality in this particular caliber, primarily due to the very short seating depth to which bullets of this type are seated in the cartridge, which causes the bullets to loosen very readily in the cartridge case even before they are loaded into a clip or fired.

Mr. EISENHBERG. Did you notice, Mr. Frazier, in your examination of targets and so forth, whether there was any marked degree of yaw or tumbling by the bullets?

Mr. FRAZIER. No evidence at all of tumbling or yaw.

Mr. EISENHBERG. In your opinion, would the firing of 60 shots materially affect the microscopic characteristics of Exhibit 139?

Mr. FRAZIER. It would change them, if not completely, practically completely.

Mr. EISENHBERG. Mr. Frazier, some witnesses to the assassination have stated that they heard more than three shots. Can you think of any reason why they might have come to that conclusion—in terms of acoustical properties of high-velocity bullets?

Mr. FRAZIER. They could very readily have heard other sounds which could be confused with shots. It is apparent—it is obvious with any weapon in which the bullet travels faster than the speed of sound, which is 1,127, approximately, feet per second, the bullet itself will cause a shock wave or a sound wave, and a person standing in front of that weapon will hear the report of the bullet passing and then subsequently the sound will reach them of the cartridge explosion, which could very easily be confused with two shots. There will be the crack of the bullet going by, overhead or in the vicinity, and then the sound of the shot.

So that you would hear for three shots actually six reports, which could have caused some confusion.

Mr. EISENHBERG. Mr. Frazier, I now hand you a bullet in a pill box which is marked Q-189. I ask you whether you are familiar with this bullet.

I would like to state for the record that this bullet was found in the Walker residence after the attempted assassination of General Walker.

Mr. MCCLOY. As far as you know, we have no proof of that, yet?

Mr. EISENHBERG. That is right.

Mr. FRAZIER. Yes, I am familiar with it. I have made an examination of that bullet.

With reference to this bullet, I could furnish everything except the weight of it.
Mr. Eisenberg. All right. Just taking one thing at a time. You are familiar with it. Does it have your marking on it?
Mr. Frazier. Yes, it does.
Mr. Eisenberg. Mr. Chairman, may I have this admitted as 378?
Mr. McCloy. It may be admitted.
(The article referred to was marked Commission Exhibit 378, and received in evidence.)
Mr. Eisenberg. When did you receive this bullet, do you recall, Mr. Frazier?
Mr. Frazier. I would need to refer to my notes for that.
Mr. Eisenberg. Could you supply that for us at a subsequent time?
Mr. Frazier. Yes, sir.
Mr. Eisenberg. And the weight.
Mr. Frazier. That was done.
Mr. Eisenberg. Is this bullet in the same condition as it was when you received it in the laboratory, Mr. Frazier?
Mr. Frazier. Yes, it is.
Mr. Eisenberg. Did you clean it up or in any way alter it when you received it?
Mr. Frazier. No, sir.
Mr. Eisenberg. Mr. Frazier, did you examine this bullet to determine whether it was or might have been fired in Exhibit 378?
Mr. Frazier. Yes, I did.
Mr. Eisenberg. And what was your conclusion?
Mr. Frazier. I was unable to reach a conclusion as to whether or not it had been fired from this rifle. The conclusion went slightly further than that, in that we determined that the general rifling characteristics of the rifle 378 are of the same type as those found on the bullet, Exhibit 378, and, further, on this basis, that the bullet could have been fired from the rifle on the basis of its land and groove impressions. And, second, that all of the remaining physical characteristics of this bullet, 378, are the same as Western 0.5-mm. Mannlicher-Carcano bullets of the type normally loaded in ammunition made for this rifle, 378. However, the mutilation of the nose of the bullet has eliminated the length characteristics, and it cannot be definitely stated that Exhibit 378 is in fact a Western Cartridge Co. product, but all of the remaining characteristics of base shape, distance from the base to the cannelure, the width of the cannelure, and the overall appearance, coloration, and so forth, are similar to Western ammunition.
Mr. Eisenberg. Is this a jacketed bullet?
Mr. Frazier. Yes, it is a copper-alloy jacketed bullet having a lead core.
Mr. Eisenberg. Can you think of any reason why someone might have called this a steel-jacketed bullet?
Mr. Frazier. No, sir; except that some individuals commonly refer to rifle bullets as steel-jacketed bullets, when they actually in fact just have a copper-alloy Jacket.
Mr. Eisenberg. Can you describe the general rifling characteristics which you referred to?
Mr. Frazier. Yes. They consist of impressions from four lands and grooves. The bullet is mutilated on a portion of its surface. However, it can be determined that there were four land impressions and four groove impressions originally on this bullet.
The width of the land impression is 7/100ths of an inch, that is 0.07 inch—whereas the width of the groove impression is 0.13 inch, or 13/100ths of an inch.
The bullet is flattened so that it was not possible to measure its diameter. However, by adding the land width to the groove width, and multiplying by the number of lands and grooves, you can determine the circumference of the bullet and mathematically determine its diameter, which in this case corresponds to 6.5 mm. ammunition, or approximately .267 inch.
Mr. Eisenberg. What was the direction of the twist?
Mr. Frazier. To the right.
Mr. Eisenberg. Could you estimate how many types of rifle would produce, on
a 6.5 mm. bullet, four lands and four grooves, right twist, with the width of lands and grooves which you established as being those on this bullet?

Mr. Frazier. Only from experience, I could say that it would be relatively few which would agree with all of those characteristics. I have, of course, not seen or measured all of the foreign rifles, and therefore I could not estimate the number that there might be.

Mr. Eisenberg. Did you find any microscopic characteristics or other evidence which would indicate that the bullet was not fired from 139?

Mr. Frazier. No, sir.

Mr. Eisenberg. Were you able to determine the depth of the grooves of the bullet?

Mr. Frazier. The bullet, 573, had what appeared to be normal-depth grooves. However, this bullet is completely flattened due to hitting a plaster or cement or other hard material on one side, and the opposite side, as a result of the flattening—has assumed a concave appearance, which has stretched the surface in various places and changes its overall appearance—that is the basis for actually having to state that there were not enough unmutated marks for identification purposes on it.

Mr. Eisenberg. But do you conclude that this was fired from a Mannlicher-Carcano 91/38, or a rifle with similar barrel characteristics?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Mr. Chairman, do you have any further questions on this?

Mr. McClory. When you say you were able to determine it was fired from this type of rifle or one similar to it, that would include a number of different kinds of rifles besides the Mannlicher-Carcano?

Mr. Frazier. Yes, sir; it could include a variety of weapons with which I am not familiar in the foreign field.

Mr. McClory. But it is definitely, according to your best judgment, a 6.5 mm. bullet?

Mr. Frazier. Yes, sir.

Mr. McClory. And the bullet, such as we find it, has new characteristics similar to the type of bullet which was our Exhibit No. 399?

Mr. Frazier. Yes, it does. Placing them side by side, the cannelure, which is really the only physical characteristic apparent, comes to exactly the same place on both 399 and 573, indicating that this bullet was loaded to exactly the same depth in the cartridge—the two bullets, both 399 and 573.

Mr. McClory. I think I have no further questions.

Mr. Eisenberg. Mr. Frazier, did any other firearms experts in the FBI laboratory examine the three cartridge cases, the bullet, and the two bullet fragments which you have testified as to today?

Mr. Frazier. Yes, all of the actual firearms comparisons were also made by Charles Killion and Cortlandt Cunningham. These examinations were made separately, that is, they made their examination individually and separately from mine, and there was no association between their examination and mine until both were finished.

Mr. Eisenberg. Did the three of you come to the conclusions which you have given us today as your own conclusions?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. Did anyone in the FBI laboratory who examined the evidence come to a different conclusion as to any of the evidence you have discussed today?

Mr. Frazier. No, sir.

Mr. Eisenberg. Is there anything you would like to add to your testimony, Mr. Frazier?

Mr. Frazier. Not with reference to this material, no.

Mr. Eisenberg. Are you thinking of—

Mr. Frazier. I am thinking of other examinations which I made, but which probably will come up at another time.

Mr. Eisenberg. You are referring to examinations such as the clothing, holes in the clothing, and the fracture in the automobile windshield?

Mr. Frazier. Yes, sir.

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Mr. Eisenberg. Yes. There will be testimony elicited at another time on those examinations, Mr. Frazier.

Mr. McCloy. Mr. Frazier will be a witness in those, too?

Mr. Eisenberg. Yes, sir.

Mr. Specter will probably elicit that testimony.

Mr. Chairman, or gentlemen, are there any other questions?

Thank you very much, Mr. Frazier.

Mr. Frazier. Excuse me. I have one photograph here that might be useful in this regard, and that is of a clip showing the six cartridges loaded into it.

Mr. McCloy. I think that might be a good idea. You might identify that, to show what we mean by clips.

Mr. Eisenberg. You have shown us photographs of a clip—the clip from the Exhibit 139 rifle?

Mr. Frazier. Yes, sir.

Mr. Eisenberg. One photograph loaded, and one unloaded?

Mr. Frazier. Yes. In one instance I put six cartridges in the clip and photographed it.

Mr. Eisenberg. Did you take those photographs?

Mr. Frazier. Yes, sir.

Mr. McCloy. Mr. Frazier, you testified that if you didn’t use the clip you would only be able to shoot one shell at a time, is that right?

Mr. Frazier. Yes, sir; this weapon does not have the box magazine commonly found in most military weapons which holds the cartridges and can be re-loaded one at a time, but they must remain in the clip, or they will malfunction. The follower in the weapon will throw the cartridges right back out of the gun.

Mr. McCloy. That explains it to my mind, because I know I have fired rifles with clips and fired them without clips. But they were much more convenient in loading.

Mr. Frazier. Yes, sir; this one is designed——

Mr. McCloy. For example, the Springfield you could load with clip or load without a clip.

Mr. Frazier. Yes, sir.

Mr. McCloy. But this one has to have a clip in order not to malfunction?

Mr. Frazier. Yes, it does.

Mr. Eisenberg. Those will be 574 and 575.

Mr. McCloy. They may be admitted.

(The photographs referred to were marked Commission Exhibits Nos. 574 and 575, and received in evidence.)

Mr. McCloy. Thank you very much, Mr. Frazier. You have been very helpful.

TESTIMONY OF RONALD SIMMONS

Mr. Eisenberg. Our next witness will be Mr. Simmons.

Mr. McCloy. Would you hold up your right hand?

Do you solemnly swear that the testimony you will give in this hearing will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. Simmons. I do.

Mr. McCloy. Please be seated.

This, as you know—the constitution of the Commission and its purpose—we want to ask you something about the firearm aspect of our hearings, and certain characteristics of this rifle that we would like to hear from you about, and if there is anything else you have that can throw light on our problems.

If you can state for the record, first, your name, and where you live.

Mr. Simmons. My name is Ronald Simmons. I live near Havre de Grace, Md.

Mr. McCloy. Mr. Eisenberg?

Mr. Eisenberg. Can you give us your position, Mr. Simmons?

Mr. Simmons. I am the Chief of the Infantry Weapons Evaluation Branch of the Ballistics Research Laboratory of the Department of the Army.

Mr. Eisenberg. And how long have you held this position?

Mr. Simmons. This position, about four years, and previous employment has been in these laboratories.