Mr. EISENBERG. Why is there this difference between familiarity with the bolt and familiarity with the trigger in dry firing?

Mr. SIMMONS. There tends to be a reaction between the firer and the weapon at the time the weapon is fired, due to the recoil impulse. And I do not believe the action of the bolt going home would sufficiently simulate the action of the recoil of the weapon.

Mr. EISENBERG. One further question.

Looking at the figures for aiming error, as discounted by round-to-round dispersion, how would you characterize the actual performance of men with this rifle—that is, not the accuracy of the weapon, but the accuracy of man and weapon.

Mr. SIMMONS. I am not sure I understand your question.

Mr. EISENBERG. Do you feel on the basis of the aiming error, discounted for round-to-round dispersion or including it, that this weapon is an easy one with which to be accurate, or a difficult one?

Mr. SIMMONS. It appears to be relatively conventional in that regard, I assume. The telescope helps in the accuracy against a target which is well displayed, as was the case here. And the weapon is reasonably conventional. So that I think it would not be significantly different from any other weapon.

Mr. MCCLOY. If you were having a dry run with this, you could certainly make yourself used to the drag in the trigger without discharging the rifle, could you not?

Mr. SIMMONS. Yes. But there are two stages to the trigger. Our riflemen were all used to a trigger with a constant pull. When the slack was taken up, then they expected the round to fire. But actually when the slack is taken up, you tend to have a hair trigger here, which requires a bit of getting used to.

Mr. MCCLOY. This does not have a hair trigger after the slack is taken up?

Mr. SIMMONS. This tends to have the hair trigger as soon as you move it after the slack is taken up. You achieve or you feel greater resistance to the movement of the trigger, and then ordinarily you would expect the weapon to have fired, and in this case then as you move it to overcome that, it fires immediately. And our firers were moving the shoulder into the weapon.

Mr. MCCLOY. I have no further questions.

Mr. EISENBERG. That is all.

Mr. MCCLOY. Thank you very much. You have been very helpful.

We shall recess now until 9 o'clock tomorrow morning.

(Whereupon, at 5:25 p.m., the President's Commission recessed.)

Wednesday, April 1, 1964

TESTIMONY OF CORTLANDT CUNNINGHAM AND JOSEPH D. NICOL

The President's Commission met at 9 a.m. on April 1, 1964, at 200 Maryland Avenue NE., Washington, D.C.

Present were Chief Justice Earl Warren, Chairman; Representative Hale Boggs, Representative Gerald R. Ford, and Mr. Allen W. Dulles, members.

Also present were Melvin Aron Eisenberg, assistant counsel; Norman Redlich, assistant counsel; Samuel A. Stern, assistant counsel; Charles Murray and Charles Rhyne, observers.

TESTIMONY OF CORTLANDT CUNNINGHAM

The CHAIRMAN. The Commission will be in order.

Mr. Cunningham, the purpose of today's hearing is to take the testimony of yourself and Mr. Joseph Nicol. We understand that you are a firearms expert with the FBI, and Mr. Nicol is a firearms expert with the Bureau of Criminal

Identification and Investigation of the Department of Public Safety of the State of Illinois.

You have both been asked to provide technical information to assist the Commission in its work.

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

Do you solemnly swear that the testimony you shall give will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. CUNNINGHAM. I do.

The CHAIRMAN. Will you be seated, please.

You may proceed with the examination.

Mr. EISENBERG. Mr. Cunningham, would you state your name and position?

Mr. CUNNINGHAM. Cortlandt Cunningham. I am a Special Agent of the FBI.

Mr. EISENBERG. And in what branch of the FBI do you work?

Mr. CUNNINGHAM. I am assigned to the Firearms Identification Unit of the FBI Laboratory, here in Washington, D.C.

Mr. EISENBERG. What is your education?

Mr. CUNNINGHAM. I have a Bachelor of Science degree from Northwestern University, and a Bachelor of Laws degree from the University of Miami.

Mr. EISENBERG. Could you briefly state your qualifications in the field of firearms identification?

Mr. CUNNINGHAM. Upon entering the FBI Laboratory, I underwent an extensive training course under the supervision of experienced examiners in the field of firearms identification, which consisted of making thousands of examinations and comparisons of bullets, cartridge cases, and weapons.

I have also done reading in the subject. I have done some research and conducted many experiments in the field. And, of course, I have made thousands of examinations on my own and testified numerous times in State and Federal courts.

Mr. EISENBERG. How many years have you been in the Laboratory, Mr. Cunningham?

Mr. CUNNINGHAM. Over 5 years, and I have been in the Bureau over 10 years.

The CHAIRMAN. The witness is qualified.

Mr. EISENBERG. To begin with, Mr. Cunningham, we had some testimony yesterday on the bullet which is thought to have been fired at General Walker. That is Commission Exhibit No. 573. Are you familiar with this bullet, Mr. Cunningham?

Mr. CUNNINGHAM. I am.

Mr. EISENBERG. Can you supply the weight of that bullet, which was going to be supplied to us?

Mr. CUNNINGHAM. I can. This bullet weighed 148.25 grains.

Mr. EISENBERG. Does that show some weight loss, if the bullet was from a 6.5 mm. Mannlicher-Carcano cartridge?

Mr. CUNNINGHAM. It does. Those bullets weigh 161 grains, but there is a great deal of mutilation on this bullet.

Mr. EISENBERG. And could you tell us when you received this bullet in your laboratory, Mr. Cunningham?

Mr. CUNNINGHAM. Yes. It was received from the Dallas office of the FBI on December 4, 1963.

Mr. EISENBERG. And when was it examined?

Mr. CUNNINGHAM. It was examined that date.

Mr. EISENBERG. Mr. Cunningham, I now hand you Commission Exhibit No. 143, and I ask you whether you are familiar with this exhibit, which, for the record, is a revolver.

Mr. CUNNINGHAM. If you will excuse me, I won't open the cylinder. I have checked the cylinder, and there are expended or fired cartridge cases in the cylinder.

Mr. EISENBERG. Which you have placed in it for a special demonstration?

Mr. CUNNINGHAM. I fired it, yes, prior to my testimony here today. I have seen this weapon before.

Mr. EISENBERG. Again for the record, this is the weapon which is believed to have been used in the murder of Officer Tippit. Can you describe this weapon in terms of name, caliber and so forth?

Mr. CUNNINGHAM. Do you want me to describe it as it is today?

Mr. EISENBERG. As it is today.

Mr. CUNNINGHAM. As it is today, it is a .38 Special Smith and Wesson, Victory Model revolver.

Mr. EISENBERG. And was it always a .38 Special?

Mr. CUNNINGHAM. No, it was not. Originally this weapon was known as a .38–200 British Service revolver. In this country the weapon would be known as a .38 caliber Smith and Wesson revolver, Victory Model. However, the British gave the designation .38–200 to it.

Mr. EISENBERG. Was this revolver made in the United States?

Mr. CUNNINGHAM. It was.

Mr. EISENBERG. And has it been in England subsequent to that?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. And how can you tell that, Mr. Cunningham?

Mr. CUNNINGHAM. Well, first of all, all weapons going into England have to be proofed. They are proofed at, usually, the Birmingham proofhouse.

Representative FORD. What does that mean?

Mr. CUNNINGHAM. They are tested for whether they will withstand a certain charge. They place in the cylinders overloaded cartridges, and they are fired, in the cylinder, as this one has been. It has been proofed to 3½ tons. Each chamber in the cylinder has been proofed.

You can tell that, because each chamber has been stamped with the Birmingham proofmark, indicating that each chamber in the cylinder has been proofed.

Mr. EISENBERG. Mr. Cunningham, could you explain to us the difference between a .38 S&W and a .38 Special?

Mr. CUNNINGHAM. They are completely different cartridges. One cartridge is a .38 Special, and the other cartridge is a .38 S&W, or actually written out it would be Smith and Wesson. It was developed for their weapons, and it is quite an old cartridge, and it is known—usually as appears on a box of ammunition—as merely a .38 S&W. However, there are many differences in the cartridges.

Mr. EISENBERG. Have you brought two—an example of each type of cartridge with you?

Mr. CUNNINGHAM. I have. First of all, this is actually a Western .38 S&W cartridge. You will see the head stamping on the base of this cartridge signifies it to be a .38 S&W.

Mr. EISENBERG. Before you go any further—Mr. Chairman, may I have this marked as an exhibit—this specimen?

I am holding a cartridge marked Western .38 S&W, and it is submitted as Commission Exhibit 587.

The CHAIRMAN. It may be admitted.

(The article referred to was marked Commission Exhibit No. 587, and received in evidence.)

Mr. CUNNINGHAM. If you would care to see one broken down, I have one with me. That is the same cartridge where the bullet has been pulled and the powder has been dumped out.

Mr. EISENBERG. That is also a .38 S&W cartridge, but it has been disassembled into a bullet and a cartridge case?

Mr. CUNNINGHAM. That is correct. The bullet has been pulled out of the cartridge case and the powder removed.

Mr. EISENBERG. Mr. Chairman, may I have this admitted as an exhibit?

The CHAIRMAN. It may be. What is the number?

Mr. EISENBERG. That will be 588.

The CHAIRMAN. It will be admitted as Commission Exhibit 588.

(The article referred to was marked Commission Exhibit No. 588, and received in evidence.)

Mr. CUNNINGHAM. This particular cartridge, which is one complete cartridge, is a Remington-Peters .38 S&W. These two components actually are of the same cartridge. All I have done is pull the bullet, and it is also a Remington-Peters .38 S&W.

Mr. EISENBERG. That is the same cartridge as Exhibits 588 and 587?

Mr. CUNNINGHAM. That is correct. The only difference is that they are different brands. They were made by two different manufacturers.

Mr. EISENBERG. Could you show that to the Chairman for his examination?

The CHAIRMAN. These appear to be lead bullets.

Mr. CUNNINGHAM. They are, sir.

The CHAIRMAN. The others appeared to be jacketed.

Mr. CUNNINGHAM. They are not, sir. It is known as gilding metal. They are copper-coated lead bullets. Actually, it is an alloy—it is not pure copper. They have been flash coated, for sales appeal, more than anything else.

Mr. EISENBERG. Does that coating serve to prevent distortion to any measurable extent when the bullet has penetrated a body?

Mr. CUNNINGHAM. No, it would not, to any appreciable amount. It is such a thin coat, as you can see. Later on I will show you the ones that have been fired, and also the bullets removed from Officer Tippit's body. You can see the coating comes off—it flakes off—it is very thin.

Mr. EISENBERG. So that Exhibits 587 and 588 are substantially similar to the R–P cartridge you have just been discussing?

Mr. CUNNINGHAM. Yes. They are both loaded to the same specifications, even though there are two manufacturers. All commercially made ammunition in this country is loaded to a specific muzzle velocity.

Mr. EISENBERG. Mr. Chairman, may I have this R–P cartridge which Mr. Cunningham has been discussing admitted into evidence as Commission Exhibit 589?

The CHAIRMAN. It may be admitted.

(The article referred to was marked Commission Exhibit No. 589, and received in evidence.)

Mr. EISENBERG. You have been showing us a .38 S&W, Mr. Cunningham?

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. Do you have an example of a .38 Special?

Mr. CUNNINGHAM. I do. The first one is a Western .38 Special copper-coated lead bullet of Western manufacture, a .38 Special. The other components I have here are components of the same cartridge from which the bullet has been pulled.

Mr. EISENBERG. May I have the cartridge case, bullet, and cartridge admitted into evidence as 590?

The CHAIRMAN. It may be admitted.

(The article referred to was marked Commission Exhibit No. 590, and received in evidence.)

Mr. EISENBERG. Now, Mr. Cunningham, could you describe to us briefly the difference——

Mr. CUNNINGHAM. Do you want the Remington-Peters?

Mr. EISENBERG. You are holding in your hand a Remington-Peters disassembled and assembled .38 Special?

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. Would you hand that to the Chief Justice? May this be admitted into evidence as Exhibit 591?

The CHAIRMAN. It may be admitted.

(The article referred to was marked Commission Exhibit No. 591, and received in evidence.)

Mr. EISENBERG. This consists of an assembled R–P .38 Special and a disassembled R–P .38 Special.

Again, I notice, Mr. Cunningham, that the R–P bullet has a lead-colored look, whereas Exhibit 590 had a copper-colored look.

Mr. CUNNINGHAM. Yes, sir. The Western coating is known by the trade name "Lubaloy." It is a trade name of the Western Cartridge Co., and it is nothing more than a gilding metal—actually, it is just a flash coating on the outside of the bullet. There is some advantage, a very small advantage, as to leading. But it is mostly for sales appeal, because with Winchester bullets, some do and some don't have the coating. Most of Winchesters which is the same bullet, have not been copper coated—that they are selling today.

Mr. EISENBERG. Now, can you explain the difference in terms of dimensions and contour, weight, and so forth, between the .38 Special bullets which you have just shown us and the .38 S&W bullets which you have shown to us?

Mr. CUNNINGHAM. Yes, sir. The complete .38 Special cartridges, both brands, they are approximately the same—they are made to specifications, and they are within—just 1/1000th difference between the two of them. They are very close. In some cases, there is a slight difference, but generally they are the same size.

The .38 Special cartridges are a little over 1½ inches in length. The .38 S&W cartridges are approximately 1.2 inches in length. In other words, there is about 4/10ths of an inch difference in their length.

The bullets of the .38 Special weigh 158 grains—both brands. The bullets in the .38 S&W cartridges—there is one grain difference—Western Lubaloy bullets weigh 145 grains, and Remington's bullets weigh 146 grains, which is very close, when you figure there are 7,000 grains to the pound.

The length of the bullets themselves—the .38 Special bullets are approximately .72 plus inch. The .38 S&W bullets are approximately .6 plus inch. The lengths of the cartridge cases are also different. A .38 Special is approximately 1.15 inches for both brands. The .38 S&W cartridge cases are approximately .77 inch. And there you have approximately a quarter of an inch difference between the lengths of the cartridge cases.

The diameters of the bullets—the .38 Special bullets, at the portion of the bullet where the case is crimped into the bullet are approximately .357".

Mr. EISENBERG. That is the groove around the base of the bullet, also known as the cannelure?

Mr. CUNNINGHAM. No, it is just above the two grooves, which are known as cannelures, where the bullet is crimped. It is known as the crimp ring. It is nothing more than where the case has been crimped in.

Mr. EISENBERG. I have pulled out the bullet from Exhibit 591, and there is a little groove running above the second groove from the top—from the bottom, the base, of the bullet.

Mr. CUNNINGHAM. That would be your crimping groove. Up at approximately that area, both .38 Specials are approximately .357". However, the bases of the .38 Specials, both brands, are about .350".

In other words, there is about 7/1000ths difference between the base and where they are crimped, and both brands of .38 Specials seem to run—slightly undersized at the base.

On the .38 Special the diameter of the bullets where they are crimped is .357". The .38 S&W Remington-Peters bullets run about .360", or just slightly less, which is about 3/1000ths larger. Their bases, both brands, run about .356". In other words, they run about 6/1000ths larger at the base—even though the bullets are shorter overall in the .38 S&W.

Mr. EISENBERG. To summarize that, in terms of the diameter, do I understand that the .38 Special and the .38 S&W have a similar diameter as you approach the nose of the bullet, but that the .38 has a somewhat larger diameter at the base than the .38 Special?

Mr. CUNNINGHAM. .38 S&W.

Mr. EISENBERG. Now, why would the gun be rechambered from the original chamber, which was designed for the .38 S&W, to the chamber as it stands now, which you tell us is designed for the .38 Special?

Mr. CUNNINGHAM. In this country, the .38 S&W is not a popular cartridge at the present time. In years gone by, many, many, many weapons have been made for that particular cartridge. But they are usually the top-break, the cheaper type of weapon. The .38 Special cartridge is a better cartridge. There is a higher velocity and everything about the cartridge is better than the .38 S&W, ballistically.

The .38 Special has become popular in this country for revolvers. And the reason it was chambered in .38 S&W originally is because in England and on the Continent it is a popular cartridge. The .38 S&W in England is the .38–200. They loaded a 200-grain bullet into the same cartridge case, and it was the standard British Army load for this particular weapon and others. Why they took that particular cartridge, I do not know.

Mr. EISENBERG. Was the gun rebarreled as well as rechambered?

Mr. CUNNINGHAM. No, it was not. The barrel of this weapon has been

cut off approximately 2¾ inches. The original barrel was 5 inches for this model.

Mr. EISENBERG. Would the failure to rebarrel affect the accuracy of the weapon?

Mr. CUNNINGHAM. It should slightly, if you are firing .38 Special bullets, because they are slightly undersized in a .38 S&W barrel. On the average, .38 S&W barrels are approximately 4/1000ths larger than the normal .38 Special barrel. In this particular weapon, that holds true.

Mr. EISENBERG. Would it affect accuracy at close range?

Mr. CUNNINGHAM. None whatsoever. And there, again, the shortening of the barrel would affect the accuracy more than the use of .38 Special, due to the fact that your sight radius has been cut down.

Mr. EISENBERG. That is to say, when you shorten the barrel, the length between the front and the back sights is shorter, therefore giving more room for error?

Mr. CUNNINGHAM. Yes, sir. In other words, the movement of the front sight will cause more of a discrepancy at the target at longer ranges, due to the shorter sight radius.

Mr. EISENBERG. Is there any functional reason for cutting the barrel down to its present short size?

Mr. CUNNINGHAM. Sales appeal, I would say, is the main reason. Also, concealment.

Mr. EISENBERG. In your experience, is a short barrel, cut-down barrel weapon like this usually purchased for legitimate purposes by other than police officers?

Mr. CUNNINGHAM. Possibly a collector. Among target shooters, it is not a popular weapon, due to the short sight radius. Revolvers with 6-inch barrels are very accurate weapons. A target shooter would not use a weapon of the short barrel type. Therefore, it is not a very popular weapon for sportsmen.

Mr. EISENBERG. Does the cutting off of the barrel increase the possibility of concealment?

Mr. CUNNINGHAM. It does, because it makes it handier. I carried, when I was in the field 5 years—I carried my personally owned firearm, which had a 2-inch barrel, due to the fact that for concealment you could not see it when I wore a suit, and it was more discreet in the type of work I was doing.

The CHAIRMAN. Can both kinds of cartridges be used interchangeably in this gun?

Mr. CUNNINGHAM. In this particular gun, yes sir. It makes no difference.

The CHAIRMAN. Either an S&W or S&W Special?

Mr. CUNNINGHAM. Yes, sir; the chambers of this particular cylinder have been bored out, it appears from the very rough marks, to accommodate the forward portion of a .38 Special cartridge. Also, when this barrel was made—or the cylinder was made—the chambers had a shoulder or lip that the .38 S&W cartridge case would fit up against. The bullet would go forward farther, but the cartridge case would fit up against this shoulder at the neck.

And in order to chamber a .38 Special, that forward portion had to be bored out slightly, several thousandths to accommodate the longer cartridge, which, by the way, is a very common thing on these surplus weapons. Practically all of them are being rechambered, due to the popularity of the .38 Special cartridge.

The CHAIRMAN. I see.

Mr. EISENBERG. Mr. Cunningham, this weapon—was this weapon sold into the United States after it had been used in England?

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. How much sign of use does it show?

Mr. CUNNINGHAM. It has definitely been used, there is no doubt. However, the cylinder is quite tight, and I would say that this weapon is in good operating condition.

Mr. EISENBERG. Now, since it was sold used, are you unable to attribute any amount of use to the last user?

Mr. CUNNINGHAM. That is right, you would not be able to tell.

Mr. EISENBERG. Mr. Cunningham, could you explain briefly the manner in which this revolver is operated, paying particular attention to extraction and loading and reloading?

Mr. CUNNINGHAM. Yes, sir. First of all, the weapon has a frame into which a barrel has been screwed and a cylinder which is hinged on a crane is also fitted into the frame. There is a cylinder release on the left-hand side of this weapon which enables one to push the cylinder to the left.

The cylinder has six chambers—in other words, it is a six-shot weapon. There is an extractor rod and an extractor in the rear portion of the cylinder. When you press on the extractor rod, either loaded cartridges or fired cartridge cases may be extracted from the cylinder so that it may be reloaded again.

Mr. EISENBERG. Now, Mr. Cunningham, in the operation of this weapon, the cylinder takes six bullets—is that correct?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. In the operation of this weapon, when six bullets have been loaded into the cylinder, is any action needed for firing except six consecutive trigger pulls?

Mr. CUNNINGHAM. That is correct. You can fire this weapon either single or double action.

Mr. EISENBERG. Now, can you explain the meaning of that?

Mr. CUNNINGHAM. Yes. Double action is accomplished by pulling the trigger. In other words, you just pull the trigger each time and you can fire this weapon six times before reloading. This weapon can also be cocked, which puts the sear on the step of the hammer and reduces the trigger pull, and may be fired that way. This is known as single action.

Mr. EISENBERG. Now, if a person using the gun and having it fully loaded with six bullets fired less than six bullets, can he use this ejector-extraction mechanism without losing his unfired bullets as well as the empty cartridge cases?

Mr. CUNNINGHAM. Yes, sir—by merely tipping the weapon. The unfired cartridge is heavier, and will fall out of the cylinder into his hand. Then he can extract the cartridge cases and load in more.

Mr. EISENBERG. Could you demonstrate that?

Mr. CUNNINGHAM. If I may have a cartridge, please.

Mr. EISENBERG. Do you have any fired cartridges in the cylinder?

Mr. CUNNINGHAM. Yes, sir; I do. Prior to my appearance here today, this morning, I fired five cartridges in this weapon, and they are still in the cylinder.

Mr. EISENBERG. You are now placing an unfired——

Mr. CUNNINGHAM. An unfired cartridge in the sixth chamber of the cylinder. Now, in a normal way, you would hit the cylinder release, push in your hand like this, and tip it up. The unfired cartridge will fall right out into your hand, due to the fact that the chambers of the cylinder are naturally larger than the cartridge you are loading in there—for ease of putting them in. When you fire a cartridge in a revolver, the case expands as wide as the cylinder. In other words, when the firing pin hits the primer, there is an explosion in the primer, the powder is ignited in the cartridge, and the terrific pressure will expand the cartridge case to tightly fit the chamber.

Mr. EISENBERG. I would like the record to show that when Mr. Cunningham tipped the revolver, the unfired bullet tipped out, but the five expended shells remained in.

The CHAIRMAN. Very well.

Mr. EISENBERG. Now, Mr. Cunningham, would you show how you would eject the five expended shells?

Mr. CUNNINGHAM. Yes. These are very difficult, by the way, to extract, due to the fact that the chamber has been rechambered. And as you can see, you get on your cartridge cases a little ballooning with these smaller diameter cases in the .38 Special.

Mr. EISENBERG. I would like the record to show that Mr. Cunningham extracted the five expended cartridge cases merely by one push of the ejector rod.

Mr. CUNNINGHAM. You won't be able to see it again, but when you eject a cartridge case—later on for the powder pattern test, I will show that you can have residues of unburned powder. That is what would happen if you ejected

these cartridge cases in your hand. You would pick up unburned powder, residues, and partially burned powder.

Mr. EISENBERG. Mr. Cunningham had ejected five cartridge cases from the revolver into his hand, and his right hand is now filled with small black particles, whose composition I am unable to determine.

Representative FORD. That would happen any time that you did it?

Mr. CUNNINGHAM. Yes, sir; every time you eject them, these particles will come out from the cylinder into your hand—unburned powder, partially burned powder, and gunpowder residues.

Representative FORD. Had you fired this morning these particular bullets?

Mr. CUNNINGHAM. Yes, sir; at 8:15.

Mr. EISENBERG. Mr. Cunningham, these cartridge cases which you ejected were .38 Special cartridge cases?

Mr. CUNNINGHAM. They were.

Mr. EISENBERG. What time did you fire those bullets, those .38 Special bullets in this revolver?

Mr. CUNNINGHAM. At approximately 8:15 this morning.

Mr. EISENBERG. Let the record show that it is now 9:45. Now, Mr. Cunningham, could this revolver be loaded on the run, or while walking?

Mr. CUNNINGHAM. It could.

Mr. EISENBERG. Have you personally loaded a revolver like this while walking?

Mr. CUNNINGHAM. Yes. And running.

Mr. EISENBERG. Does this revolver have a serial number on it?

Mr. CUNNINGHAM. It does.

Mr. EISENBERG. Could you read that number to us, please?

Mr. CUNNINGHAM. V–510210.

Mr. EISENBERG. Is this serial number unique to this particular type of weapon?

Mr. CUNNINGHAM. Yes. Smith and Wesson does not duplicate numbers. You may have a similar number, but not with the prefix "V."

Mr. EISENBERG. So this is the only such weapon with this serial number that is in existence?

Mr. CUNNINGHAM. That is correct. As far as I know. I have never found one in my experience, and Smith and Wesson does not duplicate serial numbers in a particular series of weapons.

Mr. EISENBERG. Smith and Wesson claims not to duplicate?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. Mr. Cunningham, how fast could one get off shots from this weapon, shooting rapid fire, and without sighting?

Mr. CUNNINGHAM. In a combat stance, that is crouched, with a gun at belt level, and your wrist locked, you would have no trouble at all getting off five shots in from 3 to 4 seconds.

Mr. EISENBERG. With what degree of accuracy at close range?

Mr. CUNNINGHAM. Excellent. All FBI agents, for instance, practice at 7 yards, which is 21 feet, and we are hitting in the "kill zone" without any problem.

Mr. EISENBERG. How much training would one have to have with this weapon to get four hits in four or five shots at close range into a human body?

Mr. CUNNINGHAM. None whatsoever—if you can pull the trigger and point directly at a person, at 8 feet you would not likely miss—with one exception. If you did not lock your wrist, there is a possibility you could shoot too low, or you could pull to the side. Anyone with a little bit of knowledge and with—and really grabbing hold of the weapon, would have little difficulty at all at that distance.

Mr. EISENBERG. When you say "lock your wrist," do you mean just pointing the wrist so that it is in a straight line with your lower forearm?

Mr. CUNNINGHAM. Yes. In other words, to tighten it, and not be in a relaxed position. By merely tightening the wrist, you would have no trouble at all hitting a person, approximately the same distance as Mr. Eisenberg and myself.

The CHAIRMAN. I suppose a person who had the normal small-arms training that he gets in the Marine Corps would have the ability to do what you have just spoken of?

Mr. CUNNINGHAM. Definitely, sir. As a matter of fact, with any training at all with a revolver, I would say that he would hit 90 percent of the time.

Representative FORD. Is there a recoil action at all from this kind of weapon?

Mr. CUNNINGHAM. Yes, sir; you get recoil. But if you have had any training with a weapon of this sort, the recoil is not even noticed. The first time you ever fired this weapon the recoil or the noise, might bother you. But if you have ever fired a handgun, you don't even think about recoil. You automatically adjust.

Mr. EISENBERG. Mr. Cunningham, you mentioned distance between you and me earlier, a few sentences ago. Could you estimate that distance?

Mr. CUNNINGHAM. Approximately 8 feet.

Mr. EISENBERG. If there are no further questions on the revolver, I propose to move on to identification of bullets and cartridge cases associated with the Tippit murder.

The CHAIRMAN. I have none.

Mr. EISENBERG. Mr. Cunningham, I hand you Commission Exhibits Nos. 145 and 518, which, for the record, consist of bullets, unfired bullets which were found in the revolver and the pocket of Lee Harvey Oswald following his arrest on November 22. I ask you whether you are familiar with the bullets in these exhibits.

You are now looking at which exhibit, Mr. Cunningham?

Mr. CUNNINGHAM. Commission Exhibit 518.

I have seen them before.

Mr. EISENBERG. Can you describe these bullets very briefly?

Mr. CUNNINGHAM. Yes, sir. They are cartridges. There are four cartridges. Two are Western .38 Special with copper-coated lead bullets loaded into these cartridges. The other two are Remington-Peters .38 Special cartridges, which are loaded with lead bullets.

Mr. EISENBERG. Could you describe the bullets in the other exhibit?

Mr. CUNNINGHAM. Commission Exhibit 145 consists of one Western .38 Special cartridge, which is also loaded with a copper-coated lead bullet, and the other cartridge is a Remington-Peters .38 Special cartridge, which is loaded with a lead bullet.

Mr. EISENBERG. I now hand you another group of bullets, marked Q–82 through Q–86.

The CHAIRMAN. Mr. Eisenberg, would you state for the record at this time what those two bullets are? They are introduced another time.

Mr. EISENBERG. Yes; all the bullets which Mr. Cunningham examined were found either in the pocket or the—pocket of Lee Harvey Oswald—or the cylinder of his revolver at the time of his arrest on November 22.

I now hand you another group of bullets marked Q–82 through Q–86, and with certain other markings on them.

Are you familiar with these bullets? And may I state for the record that the bullets I have just handed Mr. Cunningham derive from the same source.

Mr. CUNNINGHAM. I am familiar with these bullets.

Mr. EISENBERG. Could you describe these briefly?

Before I do that—Mr. Chairman, may I have these bullets admitted into evidence as a group, as Exhibit 592?

The CHAIRMAN. They may be admitted.

(The articles referred to were marked Commission Exhibit No. 592, and received in evidence.)

The CHAIRMAN. At this time, I shall have to leave to attend a session of the Supreme Court.

Commissioner Ford, would you preside?

And, during the morning, Commissioner Dulles will be here, I am told, and if you leave, leave him in charge, will you, please?

Representative FORD. Yes, sir.

The CHAIRMAN. Thank you very much.

Mr. Cunningham, thank you for your assistance. Glad to have seen you.

(At this point, Mr. Warren withdrew from the hearing room.)

Mr. EISENBERG. Could you describe the bullets in Exhibit 592, Mr. Cunningham?

Mr. CUNNINGHAM. Yes, sir; all five of them are Western .38 Special cartridges, which are loaded with copper-coated lead bullets.

Mr. EISENBERG. So that of a total of—you have examined a total of 11

bullets, and three are Remington-Peter—well, at any rate, of the 11 they are divided 3 and 8 into Remington-Peter and Western .38 Special bullets?

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. Now, Mr. Cunningham, I hand you four cartridge cases in an envelope marked Q–74, Q–75, Q–76, and Q–77. And I ask you whether you are familiar with these cartridge cases.

Mr. Cunningham, before going on to the cartridge cases I just handed you, could you explain when you received the bullets which are comprised in the last three exhibits, and who you received them from, and how they were presented to you?

Mr. CUNNINGHAM. Yes, sir. Commission Exhibit 145 consists of the two cartridges that we received—the FBI received from the U.S. Secret Service. We received them on December 3, 1963.

That is correct. They were personally delivered to the laboratory by Special Agent Orrin Bartlett of the FBI, who is a liaison agent with the Secret Service. And he delivered them to us on December 3, 1963.

Mr. EISENBERG. And did he identify them in any way to you when he delivered them? Did he describe their origin to you?

Mr. CUNNINGHAM. No, sir; he did not describe them to us.

Mr. EISENBERG. All right. Could you go on to the next group of five cartridges?

Mr. CUNNINGHAM. Yes. I don't know the exhibit number.

Mr. EISENBERG. That is Exhibit 592.

Mr. CUNNINGHAM. Commission Exhibit 592 was received in the FBI Laboratory from the Dallas office of the FBI on November 30, 1963.

Mr. EISENBERG. Can you tell us who you received them from?

Mr. CUNNINGHAM. The Dallas office of the FBI. I have no first-hand knowledge. I know that they were received from the Dallas Police Department—but that was due to what I have read in an FBI investigative report. The laboratory received them from the Dallas office on November 30.

Mr. EISENBERG. Can you go on to the last group of four bullets?

Mr. CUNNINGHAM. Commission Exhibit 518 was also received from the Dallas office of the FBI on November 30, 1963.

Mr. EISENBERG. Now, for the record, I would like to state that to the best of my knowledge the group of two and the group of four bullets, which together total six, were taken by the Dallas Police from the chamber of the revolver which is Exhibit 143, after the apprehension of Lee Harvey Oswald. They were then split into two groups of two and four as we have them now, two bullets being given to the Secret Service and eventually, as Mr. Cunningham relates, to the FBI, and four bullets going to the Dallas office of the FBI.

The group of five bullets was taken from a pocket of Lee Harvey Oswald, following his apprehension on November 22 and was kept separated from the remaining bullets, I believe, merely because they had been taken from a different source—that is, the pocket rather than the chamber of the revolver.

Mr. Cunningham, returning to Exhibit 145, do either of the two cartridges in Exhibit 145 bear any signs of having suffered an impact from the firing pin in the revolver, Exhibit 143?

Mr. CUNNINGHAM. An examination of these two cartridges, the primers of these two cartridges, reveals no marks that could be associated with the firing pin in Commission Exhibit 143, or any other weapon.

Mr. EISENBERG. Are there any nicks on either of those cartridges?

Mr. CUNNINGHAM. Yes. There is a small nick, an indentation, up near the edge of the primer in the Remington-Peters .38 Special cartridge.

Mr. EISENBERG. Could this nick have been caused by the firing pin?

Mr. CUNNINGHAM. There was no indication, from an examination, that that nick had been so caused by a firing pin.

First of all, it is in the wrong position, it is not in the center of the primer. And, also, a microscopic examination of that nick gave no indication that it was made by a firing pin.

Mr. EISENBERG. Did you microscopically examine the bases of both cartridge cases?

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. Now, turning to Exhibit 518, consisting of four bullets,

which, as I mentioned earlier, were, like the two bullets in Exhibit 145, taken from the chamber of the revolver, did you find any nicks in any of these bullets, the bases of any of these bullets?

Mr. CUNNINGHAM. Just by handling, there are bound to be small microscopic scratches of one kind or other. But there was no indication that any of the primers in these four cartridges had been struck by a firing pin.

Mr. EISENBERG. Were these also examined microscopically?

Mr. CUNNINGHAM. They were, individually.

Mr. EISENBERG. When you say there was no indication that they were struck by a firing pin, in your opinion, based on the construction of this weapon, if the firing pin had been drawn back to any extent and then released, would it have left a mark on one of the cartridges?

Mr. CUNNINGHAM. That is—yes and no. It depends on how far it is drawn back. As soon as the hammer internally clears the rebound block, the hammer is then able to go forward and it probably would have fired. But up to that point, the hammer is held back from striking, it cannot—under normal conditions—be made to fire a cartridge.

However, it has been found with this particular weapon, a drop of approximately 3 feet on the hammer would fire a cartridge in the chamber.

Representative FORD. How far back does the hammer have to be drawn in order to fire?

Mr. CUNNINGHAM. That can be shown very easily by holding the cylinder. By holding the cylinder, that distance can be seen, which is approximately ⅜ to ½ inch.

Mr. EISENBERG. The witness is demonstrating.

The hammer, as he says, is going back about ⅜ of an inch.

Mr. CUNNINGHAM. Once you allow the cylinder to rotate, then the rebound block is pushed out of the way, as you can see. Then you can cock the weapon.

Mr. EISENBERG. Could you demonstrate for us the sound which would be heard if you held the cylinder, pulled back, and then released the trigger?

Mr. CUNNINGHAM. Yes. A snapping sound can definitely be heard.

Mr. EISENBERG. There is a very audible snapping sound. Would that snap—that amount of snap—leave a mark on the base of the cartridge case against which the firing pin——

Mr. CUNNINGHAM. Under these conditions it could not leave a mark, because the rebound block is in the way.

Mr. EISENBERG. When you say rebound block, this is a block between the firing pin and the base of the cartridge case?

Mr. CUNNINGHAM. No, sir; it is the block that is forcing the trigger to go forward after it is pulled back. You see, your trigger will snap back. It is done by a spring in the block.

Mr. EISENBERG. To put it differently, this block would prevent the firing pin from emerging from its hole?

Mr. CUNNINGHAM. That is correct. That is exactly it.

Mr. EISENBERG. Now, could the firing pin emerge from its hole without having traveled a considerable distance back? That is, to say, at what point does the rebound block release the hammer?

Mr. CUNNINGHAM. At approximately—well, right there you can hear it. That is a good half inch.

Mr. EISENBERG. Could you pull it back and then release that half an inch to disengage the rebound block?

(The witness did so.)

Mr. EISENBERG. If the firing pin hit the cartridge with that amount of force, do you believe the cartridge would be fired?

Mr. CUNNINGHAM. Yes, sir; I do.

Mr. EISENBERG. Is there any possibility it would not be fired? Any substantial possibility?

Mr. CUNNINGHAM. It would still make a mark.

Mr. EISENBERG. It would make a mark, at any rate?

Mr. CUNNINGHAM. Let me clarify it. It still will not fire because the block will go forward.

Mr. EISENBERG. What will go forward?

Mr. CUNNINGHAM. In other words, the trigger has to be pulled through the whole cycle in a Smith——

Mr. EISENBERG. In order to disengage——

Mr. CUNNINGHAM. Either that, or cocked before the block will be out of the way. When you pull the trigger and you don't release it or if it is in the cocked position and the trigger is pulled and not released, the hammer will stay forward. The firing pin will stay forward, so you can see it out through the breech face, as long as the trigger is pulled. Then when you release the trigger, the rebound block throws your trigger forward, so the weapon can be fired again.

Mr. EISENBERG. You are modifying what you had said previously?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. And you do that upon closer examination of the weapon?

Mr. CUNNINGHAM. No; it is on the basis of trying to describe an internal part without seeing it. If you would care to, I can show you what it looks like. I have a photograph of the National Rifle Association breakdown. It would be easier to explain if I could show you what I am referring to.

Mr. EISENBERG. Could you, please?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. Before you refer to this diagram, could I take a look at it?

Congressman Ford, could I have that diagram admitted into evidence?

Representative FORD. It will be admitted.

Mr. EISENBERG. That will be 593.

(The document referred to was marked Commission Exhibit No. 593, and received in evidence.)

Representative FORD. Mr. Eisenberg, do you want the whole article?

Mr. EISENBERG. I think we might as well put the whole article in, yes.

(To Mr. Cunningham.) Perhaps it would be easiest if you came around here, since the diagram is a small one.

Now, the diagram which you are referring to is on page 61, the second page of this Exhibit 593?

Mr. CUNNINGHAM. Right.

As you can see, it is a diagram with the sideplate removed, which is this portion right here. It is the right-hand side of the weapon. (Witness pointing to revolver.) We are looking down on it with the sideplate on. These four screws hold on the sideplate.

When you pull the trigger of——

Mr. EISENBERG. The sideplate is marked 20 over here?

Mr. CUNNINGHAM. Yes—No. 20 is the sideplate.

Mr. EISENBERG. That is in the diagram.

Mr. CUNNINGHAM. No. 42 in the diagram is the trigger. There is a sear arrangement on the trigger, attached to the trigger. If you cock it, the sear arrangement will go up into a notch on the hammer right there, and hold it back—right in here.

Mr. EISENBERG. That is number——

Mr. CUNNINGHAM. You see, this is the sear.

Mr. EISENBERG. Mr. Cunningham, could you use numbers?

Mr. CUNNINGHAM. Yes. No. 39 is the sear, and the sear is attached to the trigger, which is No. 42 in the diagram.

Mr. EISENBERG. Now, we are referring to the first page of the exhibit.

Mr. CUNNINGHAM. When the trigger is pulled on this particular weapon, or if the hammer is drawn back, there is a notch on the hammer which is engaged by the sear. When the hammer is back you have to pull the trigger to disengage the sear mechanism from the hammer. When you pull back and it is in the notch, that is known as single-action firing.

Also, No. 30 in the diagram is known as the rebound slide or block, and this rebound slide is positioned right behind the trigger on an internal part of the weapon. When the trigger is pulled, the recoil slide runs in a horizontal direction. As you can see by the larger drawing right here—it is a small camming action. It comes up, and is being pushed back.

Mr. EISENBERG. That is in the middle of the second page of the exhibit.

Mr. CUNNINGHAM. Now, do you see the rounded portion of the hammer right here, right in front of the notch?

Mr. EISENBERG. That is No.——

Mr. CUNNINGHAM. Number—on No. 42, the hammer, on the bottom, right next to the notch that the sear engages, is a rounded portion. That is—in actuality, this rebound slide acts as an internal safety, so the hammer cannot go forward unless the trigger is pulled or it is cocked, because it is in the way. It cannot go all the way forward, due to the fact that—right there you can see it very plainly in the schematic numbered drawing on page 2.

Mr. EISENBERG. The number you are pointing to is what?

Mr. CUNNINGHAM. It is on the trigger, number——

Mr. EISENBERG. Forty-two?

Mr. CUNNINGHAM. Not trigger—the hammer, No. 34.

By the way, on the prior 42 I meant 34. I got the wrong number. I was referring to the right piece, but the wrong number.

But you can see this little—it is like a curved portion. It prevents the hammer from going any further forward. The firing pin will not come out of the hole in the breech face.

Now, as soon as you pull the hammer back, the rebound slide, No. 30, is out of the way.

Also, when you pull the weapon through double action, that slide pushes back, and your sear doesn't even touch the groove in the hammer, but it just keeps on going right on through. In other words, you are pulling the trigger strictly against the mainspring all the way. When it is on the notch, it is being held, and the only pressure needed, is to take off the sear.

Mr. EISENBERG. Now, Mr. Cunningham, to focus this line of questioning, Officer McDonald, who has reported that he was in a struggle with Lee Harvey Oswald on November 22d, while Oswald was in possession of this revolver, has stated that—I am reading now from an affidavit, from a letter from Officer McDonald to Mr. J. E. Curry, chief of police of the Dallas Police Force, dated December 3, 1963.

He states in this letter that as he came in contact with Oswald, "I managed to get my right hand on the pistol over the suspect's hand. I could feel his hand on the trigger. I then got a secure grip on the butt of the pistol. I jerked the pistol and as it was clearing the suspect's clothing and grip, I heard the snap of the hammer, and the pistol crossed over my left cheek. I marked the pistol and six rounds at central station. The primer of one round was dented on misfire at the time of the struggle with the suspect."

Now, in light of your examination of this weapon, and your discussion, could you comment on this statement?

Mr. CUNNINGHAM. I personally have fired this weapon numerous times, as well as Special Agents Robert Frazier and Charles Killion. At no time did we ever attempt to fire this weapon that it misfired. It operated excellently and every time we have tried to fire it, it has fired.

It is very possible when he says that he reached across, and he grabbed it, that he locked the cylinder, which I think any trained police officer would do. You want to stop this cylinder from rotating. As soon as you do that, you have actually stopped the hammer falling on a live round, because if the hammer is allowed to go forward again, and it hasn't gotten into the cocked position, the rebound slide, as I was stating before, would block the firing pin from striking the primer of the cartridge.

Mr. EISENBERG. As I understand it, the cylinder is so interconnected with the trigger, that the trigger cannot be pulled all the way back when the cylinder has been firmly grasped?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. And if the hammer has not been pulled all the way back, the rebound slide will not allow the firing pin to strike the cartridge?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. Now, Officer McDonald's statement that the primer of one round was dented on misfire: as far as you can tell, could this statement be confirmed?

Mr. CUNNINGHAM. No, sir; we found nothing to indicate that this weapon's firing pin had struck the primer of any of these cartridges.

Mr. EISENBERG. Now, if the firing pin had struck the primer, it could only have been after the trigger was pulled all the way back, under the discussion you have just given us, is that correct?

Mr. CUNNINGHAM. Or after cocking.

Mr. EISENBERG. Or after it had been cocked and pulled?

Mr. CUNNINGHAM. Yes; if it is in the cocked position, grabbing the cylinder will do you no good; due to the fact that in the very operation of cocking this weapon, the cylinder is rotated, and it is ready to be fired.

Mr. EISENBERG. Now, in either event, the hammer would have traveled almost to the outermost extremity to which it can go. That is, the hammer would have traveled back all the way, whether it was cocked or fired in a double-action manner. If that had happened, what would the likelihood be that upon returning to the cartridge case, it would not fire the cartridge case—that upon returning to the cartridge, the cartridge would not be fired?

Mr. CUNNINGHAM. You mean actually the hammer had gone all the way through its cycle?

Mr. EISENBERG. Yes.

Mr. CUNNINGHAM. I can only say that from my examination internally, as well as having fired this weapon—I found no reason why you would get a misfire with this weapon.

Mr. EISENBERG. Now, if a man had put his hand between the hammer and the point at which the hammer enters, with the firing pin, into the breech face, would that stop the weapon from firing?

Mr. CUNNINGHAM. Yes and no. It is very possible that you can do it. And it hurts, by the way, because the mainspring in this one—you can see the indentation in my thumb—is a very strong mainspring. It would be possible. You could put something in there.

Now, the question is when you pull that object out, would there be enough distance and enough force to set off the primer?

That is quite a moot point, because you could grab the hammer and recock it.

Mr. EISENBERG. Apart from that question, would the man's finger or whatever object he stuck in there be firmly fixed for a second or two, between the hammer and the breech face?

Mr. CUNNINGHAM. It could be.

Mr. EISENBERG. Would he feel the impact?

Mr. CUNNINGHAM. He would definitely feel the impact—if he had a piece of tissue of his hand in between. Now, if a piece of material, of course, went between it which I don't know how it could happen—if you were struggling over the gun, and he said he grabbed the gun—I don't know how he could have anything except a portion of his hand, and I am sure he would feel it if the trigger was pulled.

Mr. EISENBERG. Finally, if he had just grasped the cylinder, and Oswald had pulled back on the trigger, could you demonstrate the sound which might have been heard?

Mr. CUNNINGHAM. Yes; you can hold it, and you get a snapping sound—if the gun is grabbed away forcefully, and he would be really grabbing hard. So there could have been an attempt to shoot and a snap would be heard. Yes, sir.

Mr. EISENBERG. The only thing which is unlikely is that the primer would be dented on the misfire?

Mr. CUNNINGHAM. You would not get any denting if the cylinder was held and the gun was jerked forcibly out of Oswald's hands. You would hear the snap, but you would get no mark on the primer whatsoever.

The same thing he could hear if he jerked it out of his hands and he accidentally, somehow, hit the hammer—you would still get a noise, a snapping sound. But the firing pin would not come in contact with the primer of the cartridge.

Representative FORD. Because of the discussion we had a few minutes ago?

Mr. CUNNINGHAM. Yes, sir.

Representative FORD. Using the diagram that was inserted as Exhibit 593.

Mr. EISENBERG. One final question. Officer McDonald says in this letter, "I then got a secure grip on the butt of the pistol."

Now, would that grip in itself in any way interfere with the action of the pistol—the revolver?

Mr. CUNNINGHAM. I don't know what he means by that.

Mr. EISENBERG. If he means what he says, that is, if he got a secure grip on the butt——

Mr. CUNNINGHAM. If he got a secure grip on the butt, that would take him away.

Mr. EISENBERG. Take him away from what?

Mr. CUNNINGHAM. That would take him away from the cylinder. If you are fighting over a weapon, the first thing is to get it off of you and then get hold of the cylinder. And then you can get both hands on the gun to jerk it away. That is what I would do.

As I say, it is the way we are taught. You want to get the gun off of you first, so you are not in direct line, and then go in and attempt to get it away from the person.

Mr. EISENBERG. Now, suppose the gun was pulled away from Oswald as Oswald had his grip on the trigger, so that he could not get the trigger through the complete cycle. Would there be a snapping noise made?

Mr. CUNNINGHAM. Definitely. If you locked the cylinder and jerked it away, you would get a snapping noise.

Mr. EISENBERG. Suppose you did not lock the cylinder, but for some reason or other the full trigger cycle was not gone through?

Mr. CUNNINGHAM. Then you would also get it. It would be difficult, but you could get it.

Mr. EISENBERG. How hard do you have to pull on that trigger in order to fire the weapon?

Mr. CUNNINGHAM. For double action—that is, without cocking, it is approximately 11 to 12 pounds, which is normal for this type of weapon.

Mr. EISENBERG. Now, I handed you earlier four cartridge cases in a plastic envelope marked Q–74, Q–75, Q–76, and Q–77, also marked C47–C50. Are you familiar with these cartridge cases?

Mr. CUNNINGHAM. I am. I have previously looked at them.

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

Mr. CUNNINGHAM. They do. Right on the side of each one, right there.

Mr. EISENBERG. When did you receive these cartridge cases?

Mr. CUNNINGHAM. These cartridge cases were received from the Dallas office of the FBI on November 30, 1963.

Mr. EISENBERG. For the record, I would like to state that these cartridge cases were found in the immediate proximity of the site at which Officer Tippit was killed. They were found on the ground near the street where Officer Tippit was killed on November 22.

Representative FORD. These are the ones that were found in the street near the automobile?

Mr. EISENBERG. Well, either in the street or in a lawn in front of a private residence, or semiapartment house.

Representative FORD. I see. In other words, they were possibly some of those that were on the lawn in the front of 400?

Mr. EISENBERG. Yes, sir; again, for the record only, since this witness is unable to testify as to where they were picked up. The mechanism of this revolver is such that the shells are not ejected until the user decides to eject them—unlike a bolt-action rifle where the cartridge must be ejected where you shoot from.

Mr. Chairman, I would like to have these four cartridge cases introduced into evidence as 594.

Representative FORD. They may be admitted.

(The articles referred to were marked Commission Exhibit No. 594, and received in evidence.)

Mr. EISENBERG. Now, Mr. Cunningham, could you describe the make of these cartridge cases?

Mr. CUNNINGHAM. Two of these cartridge cases are Remington-Peters .38 Special cartridge cases. The other two cartridge cases are Western .38 Special cartridge cases.

Mr. EISENBERG. Now, you examined earlier six bullets which I told you had been—six cartridges which I told you had been taken from the chamber of the revolver which we have been looking at.

Those cartridges were divided into three Remington-Peters and three Western, were they not?

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

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. So that—or 50–50. So that the division is the same, the division of the cartridge cases is the same, as between Remington-Peters and Western, as the division of the cartridges found—which I told you were found in the chamber?

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. Did you examine the cartridge cases in Exhibit 594 in an attempt to determine whether they had been fired in Exhibit 143, the revolver, to the exclusion of all other revolvers?

Mr. CUNNINGHAM. I did.

Mr. EISENBERG. Can you tell us your conclusion?

Mr. CUNNINGHAM. As a result of my examination, it is my opinion that those four cartridge cases, Commission Exhibit 594, were fired in the revolver, Commission Exhibit 143, to the exclusion of all other weapons.

Mr. EISENBERG. When did you perform this examination, Mr. Cunningham?

Mr. CUNNINGHAM. On November 30, 1963.

Mr. EISENBERG. And how did you make the examination?

Mr. CUNNINGHAM. I first marked these cartridge cases upon receiving them. There were four. I would like to state, first of all that Special Agents Frazier and Killion also independently examined these four cartridge cases, and made the same comparisons that I am going to state. I am telling you what I found—although they independently arrived at the same conclusion.

The cartridge cases were first marked and examined for the presence of any individual characteristic marks on these cartridge cases whereby it would be possible to identify them as having been fired in a weapon. I then test-fired Commission Exhibit 143, using similar ammunition, and microscopically compared the four cartridge cases—one at a time—that is Commission Exhibit 594—with the tests obtained from the revolver, Commission Exhibit 143.

Mr. EISENBERG. I hand you here two cartridge cases, and ask you whether you are familiar with these cartridge cases?

Mr. CUNNINGHAM. I am.

Mr. EISENBERG. And can you describe these cartridge cases to us?

Mr. CUNNINGHAM. Yes. One is a Western .38 Special cartridge case. The other is a Winchester .38 Special cartridge case.

Mr. EISENBERG. And how did you get possession of these cartridge cases?

Mr. CUNNINGHAM. These were test-fired in Commission Exhibit No. 143, by myself.

Mr. EISENBERG. So these are the test cartridges you were referring to?

Mr. CUNNINGHAM. That was a portion of them; yes.

Mr. EISENBERG. Mr. Chairman, may I have these admitted as Commission Exhibit 595?

Representative FORD. They will be admitted.

(The articles referred to were marked Commission Exhibit No. 595, and received in evidence.)

Mr. CUNNINGHAM. I also would like to state that we were test firing Remington-Peters, also.

Mr. EISENBERG. How many test cartridges were fired, Mr. Cunningham?

Mr. CUNNINGHAM. To begin with, three. And we have since fired the weapon many times.

Representative BOGGS. How many cartridges were fired by Oswald?

Mr. EISENBERG. We are going to get into that. This is a difficult question which you are going to have to make a decision on. So I would rather develop that slowly.

I notice that one of the cartridge cases in Exhibit 595 is split on the side, Mr. Cunningham.

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. Why is that?

Mr. CUNNINGHAM. That is due to the oversized chambers of this revolver. As I previously testified, the weapon was originally chambered for the .38 S&W, which is a wider cartridge than .38 Special. And when a .38 Special is fired in this particular weapon, the case form fits to the shape of each chamber. And in one of those cartridges, the metal just let go. Normally it does not; however this one particular case split slightly.

Representative FORD. Does that have any impact on the rest of the operation?

Mr. CUNNINGHAM. No, sir. As a matter of fact, I test-fired the weapon originally, and I didn't even know it had split until I tried to eject it.

Mr. EISENBERG. You mentioned before, by the way, that there had been no misfires with this weapon. Approximately how many times was the weapon fired altogether?

Mr. CUNNINGHAM. I would have no way of knowing exactly, but I imagine we are approaching close to a hundred times by now.

Mr. EISENBERG. And no misfires?

Mr. CUNNINGHAM. And no misfires.

Mr. EISENBERG. Now, Mr. Cunningham, did you take photographs of the cartridge cases which you have just identified as having been fired from 143, and the cartridge cases which are Commission Exhibit No. 595?

Mr. CUNNINGHAM. I did.

Mr. EISENBERG. Did you make your identification on the basis of the photographs or on the basis of your examination under the microscope?

Mr. CUNNINGHAM. My conclusions were arrived at strictly on the basis of my examinations. These photographs in no way entered into the identification and are strictly for demonstrative purposes.

Mr. EISENBERG. Could you show us those photographs, Mr. Cunningham?

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. Let's take them one at a time, and let's introduce them as exhibits, one at a time. I have here—you have given me five photographs.. Did you take each of these photographs?

Mr. CUNNINGHAM. As a matter of fact; I did. I personally took these.

Mr. EISENBERG. And these are photographs of what?

Mr. CUNNINGHAM. They are photographs of the individual characteristic marks on the base and in the firing-pin impression on test cartridge cases obtained from Oswald's revolver, and also the marks on the base and in the firing-pin impression on the cartridge cases, Commission Exhibit No. 594.

Mr. EISENBERG. Mr. Chairman, I would like these admitted, if you would, as 596, 597, 598, 599, and 600.

Representative FORD. They may be admitted.

(The documents referred to were marked Commission Exhibits Nos. 596 through 600, and received in evidence.)

Representative FORD. Will the witness explain to the Commission what they mean?

Mr. EISENBERG. Yes; he will. Did you also make a photograph of the breech face of the weapon, Mr. Cunningham?

Mr. CUNNINGHAM. I did. I didn't take this photograph. I was present when it was taken. I have compared the negative with the actual breech face of Commission Exhibit 143, and I found it to be a true and accurate reproduction.

Mr. EISENBERG. Could you show us that photograph? May I have that admitted as 601, Mr. Chairman?

Representative FORD. It may be admitted.

(The document referred to was marked Commission Exhibit No. 601, and received in evidence.)

Mr. EISENBERG. Could you show us the area of the revolver which corresponds to the area shown in the photograph, Exhibit 601?

Mr. CUNNINGHAM. Yes, sir. The cylinder was first removed to facilitate the photograph. That is very easily done by removing the forward sideplate screw, which is just above the trigger, which allows the crane to slide right out, and the cylinder removed.

The photograph was taken from the right side, looking in toward the firing-pin hole.

Representative Boggs. Just the way you are holding the revolver now?

Mr. Cunningham. Yes, sir; just the way I am holding it now.

Representative Boggs. With the cylinder removed?

Mr. Cunningham. With the cylinder removed.

Mr. Eisenberg. Now, there is a cylindrical-shaped object in the center of that picture, Mr. Cunningham. Could you describe what that is—right in the center of the picture?

Mr. Cunningham. That is known by two different names. It is known as a hammer-nose bushing, or a recoil block. It is—Smith and Wesson presses this particular block in. It forms the hole through which the firing pin comes out of the breech face.

Mr. Eisenberg. That is, the firing pin strikes the center of the cartridge, or the primer, as it is called?

Mr. Cunningham. Yes.

Mr. Eisenberg. Which causes the cartridge to fire. Now, what is the magnification of the photograph of the breech face?

Mr. Cunningham. Of the breech face, it is approximately 17 times.

Mr. Eisenberg. There are a number of markings or lines on this breech face. Are these the microscopic characteristics which reproduce on the cartridge cases?

Mr. Cunningham. That is correct.

Mr. Eisenberg. And are the microscopic characteristics of this breech face individual to this weapon, to the exclusion of all other weapons?

Mr. Cunningham. They are.

Mr. Eisenberg. This is your method of determining that a given cartridge case has been fired from a given weapon?

Mr. Cunningham. The breech face marks, as well as the individual imperfections in the firing pin.

Representative Boggs. Let me ask a very elementary question, the answer to which I used to know years ago, but I have forgotten. Just exactly what does the firing pin do? What happens after that strikes?

Mr. Cunningham. Well, it is easier to start with the cartridge itself. The components of a cartridge are a bullet, a cartridge case, a primer in the base of the cartridge case, and powder.

Now, the primer is made out of a very soft metal that can be dented. These primers at manufacture are filled with, basically, an explosive. For instance, Remington-Peters cartridges have PETN, which is one of Du Pont's explosives. RDX is used as one of the components of Western cartridge cases, as well as lead styphnate, lead azides, and other explosive materials.

When the firing pin strikes, there is a small explosion. Fire is given off——

Representative Boggs. How does that bring about the explosion?

Mr. Cunningham. It is sensitive to detonation by a sharp blow.

Mr. Eisenberg. That is, the primer is sensitive?

Mr. Cunningham. Yes; it is an explosive. To differentiate from the powder, which is not explosive. Powder burns.

Mr. Eisenberg. Now, I have taken Commission Exhibit No. 591, which consists of an unfired cartridge, and there is a round circle in the middle of the base of that cartridge. Is that the primer?

Mr. Cunningham. Yes. That is actually a separate entity that has been pressed into a hole in the base of the cartridge case.

Mr. Eisenberg. And that is more sensitive to shock than the powder in the cartridge case itself?

Mr. Cunningham. Yes. Powder is relatively insensitive. You don't set off powder by a blow.

Mr. Eisenberg. But the primer is quite sensitive?

Mr. Cunningham. That is normally. I am talking about a normal blow. The primer is very sensitive. I just named a few of the components, but there are many other compounds in priming mixtures, which are considered secret by each company. But I know that they are explosive mixtures. And the actual striking of the firing pin—with enough force—causes a small detonation to occur. The fire given off, goes through holes in the base, and into where the powder is, and starts the powder burning. It is the gases that are given off when powder

burns, which actually cause the bullet to move forward—the pressure builds up behind it, and the bullet goes forward.

Representative BOGGS. That is a very good explanation. Thank you.

Mr. EISENBERG. Mr. Cunningham, I wonder whether you could review the pictures with us, and discuss some of the markings which you found in those pictures that led you to decide that the cartridge cases shown therein have been fired in the revolver we have been discussing.

Mr. CUNNINGHAM. Yes. The first photograph is a photograph of the breech-face marks, the individual characteristic marks remaining on test cartridge cases obtained from the revolver, and on the C–50 cartridge case that was recovered from the scene. C–50 is on the left. C–15 is on the right. And the hairline, the magnified hairline down the center separates the two cartridge cases.

Mr. EISENBERG. Now, is the invariable procedure to put the test cartridge on the right and the suspect cartridge on the left? Or at least is that your standard procedure?

Mr. CUNNINGHAM. I usually put the suspect on the left.

Mr. EISENBERG. Well, in the photographs at any rate, in all the photographs we are going to see, the test cartridge is on the right, and the suspect cartridge is on the left?

Mr. CUNNINGHAM. Usually.

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

Mr. CUNNINGHAM. It is approximately 91 times.

Mr. EISENBERG. Could you go on, please?

Mr. CUNNINGHAM. Yes. On the left you will see the stamping, "SP", which is in the cartridge case itself. And over here next to the hairline you will see the individual characteristic marks. And you will see similar marks continuing on the other side of the hairline.

On the C–15, the revolver side, you will see a dark portion running vertically down through. That is the space that the Congressman was asking about—how it fits the primer. That is the small space at the top where the primer fits into the base of the cartridge. And over here to the right of that dark mark you will see a lighter colored object with more individual characteristic marks, that is actually the primer, the individual characteristic marks on the primer of the test cartridge case.

Mr. EISENBERG. Now, as I understand it, in effect this picture can be viewed as a composite cartridge? That is, the picture on the left begins where the picture on the right ends, in terms of position on the cartridge case?

Mr. CUNNINGHAM. In essence; yes.

Mr. EISENBERG. And the point of the picture is to show that when you make this composite, the lines on each case show up as if there were no composite at all, but as if they were simply one case, because they are so close together in microscopic markings?

Mr. CUNNINGHAM. Yes; in proximity. And they are brought together.

Representative BOGGS. And so similar?

Mr. CUNNINGHAM. Yes.

Representative BOGGS. What is the magnification again?

Mr. CUNNINGHAM. That is approximately 91 times.

Mr. EISENBERG. Are there any dissimilarities on the two—on the test and the suspect cartridge cases, Mr. Cunningham?

Mr. CUNNINGHAM. Yes, sir; there are always dissimilarities. However, the similarities so outweigh the dissimilarities that it is an identification. If there are no dissimilarities, I would be suspicious that it would be faked—using the same photograph and just cut and put together.

There are always dissimilarities.

Mr. EISENBERG. Can you explain why there are always dissimilarities when the two cartridge cases are fired in the very same weapon?

Mr. CUNNINGHAM. The metal is different; one cartridge case is slightly harder than another; for some reason the cartridge case wasn't driven back, upon firing, into the breech face exactly the same way. In other words, these marks are reproducing, but you don't get exactly the same hit. It would not be possible to get exactly the same hit time after time with different cartridge cases.

Representative FORD. What ratio of similarities and dissimilarities do you have to have?

Mr. CUNNINGHAM. There is no ratio. Based upon the examiner's training and experience, he comes to the conclusion that a particular cartridge case or bullet has been fired from a particular weapon. As in this photograph, you can see the dissimilarity is very slight. These are excellent marks.

Representative FORD. There was never any doubt in your mind, then?

Mr. CUNNINGHAM. None whatsoever.

Mr. EISENBERG. You say these are particularly strong marks?

Mr. CUNNINGHAM. These are very, very, good marks.

Mr. EISENBERG. Now, these marks are on the brass, so to speak, of the cartridge case, rather than in the primer?

Mr. CUNNINGHAM. Yes; that is correct. Actually, it is brass, it is nickelplated brass.

Mr. EISENBERG. Is that unusual, to be able to pick up such strong marks in the brass as opposed to the primer of the cartridge case?

Mr. CUNNINGHAM. It is not really unusual; no. It depends upon the particular weapon.

Mr. EISENBERG. Did you also examine the microscopic markings on the primer?

Mr. CUNNINGHAM. I did.

Mr. EISENBERG. And you found what?

Mr. CUNNINGHAM. I could identify the weapon on the basis of the imperfections, individual characteristic marks, in the firing-pin impression.

Mr. EISENBERG. The firing-pin impression. And what about the area of the primer around the firing-pin impression?

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. In other words, each of these three areas—the brass, the primer, and the firing-pin impression—carries individually characteristic microscopic marks which would be the basis of identification?

Mr. CUNNINGHAM. Yes, you cannot make a flat statement.

Mr. EISENBERG. No; in this case.

Mr. CUNNINGHAM. In this particular case, I knew at the time I was examining it, all of the firing-pin impressions were excellent, and some portions of the breech-face marks were. But you cannot say they will mark in exactly the same place, due to the fact that these cases will mark in different areas, they are different cartridges, they have been fired at a different time. You will get good areas, and then in another area your marks will not be sufficient. In other words, it is just the way the cartridge case was driven back at the time of the explosion in the primer, and the bullet is fired.

They can hit slightly different, hit deeper on one side, be lighter on the other. When a primer is set in a little bit deeper, it will not pick up these marks on the primer part, whereas the firing-pin impression can be excellent—one portion of the case will be excellent. But each one is a different examination. And many times they will mark in different places.

Mr. EISENBERG. Could you show us the next photograph?

Mr. CUNNINGHAM. Yes, sir. This is Commission document No. 597. This is a photograph, photomicrograph, rather, of the breech face marks on two cartridge cases. The one on the left is C–49, which is our number C–49, and the one on the right of the hairline is a test cartridge case from this revolver.

Mr. EISENBERG. What is the magnification?

Mr. CUNNINGHAM. This one was approximately 120 times.

Mr. EISENBERG. Is the magnification equal on both sides?

Mr. CUNNINGHAM. It is.

Mr. EISENBERG. Is that true of all the pictures you are showing us today?

Mr. CUNNINGHAM. Yes, sir. The negative is taken at exactly the same time. You are photographing through a single eyepiece, with a focusable hairline down the middle, whatever is on both stages of your comparison microscope.

Mr. EISENBERG. Could you turn that picture around again?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. These marking are also on the brass, or outside of the primer?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. And again it is a sort of a composite photograph?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. Now, these markings seem a little less distinct than the others.

Mr. CUNNINGHAM. It is in a different area. On this particular case, the marks are excellent. You can see down in here some nice fine marks, and then the heavier marks coming across there. They are good marks.

Representative FORD. Could you point out, as you look at the photograph, what you consider good similarities, which would help you in the identification?

Mr. CUNNINGHAM. Yes, sir. Now, this is not the only point of similarity. These strictly demonstrate the type of marks. There are many more marks on these cartridge cases, all over the base of the cartridge cases, as well as in the firing-pin impressions. But Mr. Eisenberg asked that we have a photograph to demonstrate the type of marks on each particular cartridge case.

Representative FORD. This is only illustrative, then?

Mr. CUNNINGHAM. That is correct. My identification was not based on this picture. It was based on my complete microscopic examination and comparison of test cartridge cases from the revolver with this particular cartridge case.

Representative FORD. Could you show me the similarities?

Mr. CUNNINGHAM. Yes. You see, you have your large—it is slightly out of focus up towards this end——

Mr. EISENBERG. Excuse me, as you demonstrate this, could you mark with circles and with a number what you are talking about, so when the record is looked at it is clear what you are talking about?

Mr. CUNNINGHAM. All right—up here, near the top, you will find a very deep ridge, which I will mark "1." As you are coming down, you will find another real deep ridge, which I will mark "2."

When you consider this is 120 times, this is actually quite close together, except it has been magnified—you have a set of marks resembling "railroad tracks," which I will mark "3."

You will find over here—you go down to your next step. There are similarities in between there. The next big set of "railroad tracks" I will mark "4."

Then you move down, and you will find another similarity, four nice marks down near the bottom. This whole area is similar. You are going out of focus, but you can see these "railroad tracks." They are running along very nicely, and that is being marked "No. 5."

The next photograph is a photograph—on the left of the hairline——

Mr. EISENBERG. What Commission exhibit is that?

Mr. CUNNINGHAM. No. 598.

On the left of the hairline is our number C–47, the cartridge case. On the right is a test from the C–15 revolver, which is Commission Exhibit 143. These also are breech-face marks in the base of the cartridge cases.

On the right you can see the space between the primer and the base of the cartridge case, and also the individual characteristic marks in the primer.

Mr. EISENBERG. What is the magnification?

Mr. CUNNINGHAM. This is approximately 123½ times.

Mr. EISENBERG. Congressman Ford, would you care for a discussion of this?

Representative FORD. No. The one previously gave the basis.

Mr. CUNNINGHAM. Actually, this seems to be a slightly larger area. You have again the same "railroad tracks," all up and down, going across the two cartridge cases.

Representative FORD. To the layman that seems even more——

Mr. CUNNINGHAM. Demonstrative, yes. I don't know if you saw the photographs of the cartridge cases in the rifle, the assassination rifle. Those marks are just as distinctive as the more demonstrative marks in this particular breech face. But to a trained examiner, they stand out. They are harder to see than those on these particular photographs. And even in these photographs, the photograph you were asking me, they were not quite as vivid as they are on this photograph.

But there, again, it goes back to what I told you—each cartridge case will strike the breech face in a slightly different way, and you don't get complete similarity.

Mr. EISENBERG. To illustrate your point, Mr. Cunningham, I hand you Commission Exhibit 565, which is a photograph, which was explained yesterday, of the cartridge case fired in the rifle, and a test cartridge.

Mr. CUNNINGHAM. Yes, this demonstrates it very well.

This is the very rough surface on the bolt of the assassination rifle.

Mr. EISENBERG. The bolt face?

Mr. CUNNINGHAM. Yes; the bolt face, and it is just as distinctive as these striae on my photographs of the breech-face marks of the revolver.

Mr. EISENBERG. By "striae" you mean lines?

Mr. CUNNINGHAM. Yes; just lines. But it is more difficult to see, due to the character of these marks—even though one type of mark is just as characteristic as the other type.

Mr. EISENBERG. As I understand your testimony, to the trained observer the photograph shown—the cartridges shown in the photographs on 565 can be as easily identified with each other as the cartridges shown on, let's say, 598?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. But to the layman it is easier to see the similarities on 598, with its striae, than 565 with its grosser imperfections?

Mr. CUNNINGHAM. Yes, sir; due to the type of marks on each of the cartridge cases, one is easier for the layman to see.

The next photograph is Commission document No. 599. On the left of the hairline is our number C–48, the cartridge case. On the right is the test cartridge case from Oswald's revolver.

Now, here you asked about what happens—somebody asked what happens on the other side. Here you have the other side. In this particular cartridge case——

Mr. EISENBERG. That is the other half of the cartridge case?

Mr. CUNNINGHAM. Yes, sir. In other words, you are seeing the primer, the space between the primer and the brass on the cartridge case itself—on the questioned cartridge case this time—and the base of the cartridge case of the test is on the right. It looks like it is one. It is just the opposite side of the cartridge case from the other photographs.

In other words, you take the photograph of the most demonstrative marks—which look real good, naturally. The examination is of all the marks. That is the big difference. And this time you will see—it is very demonstrative—on each side of the hairline, a great deal of similarity between these marks.

Mr. EISENBERG. And the magnification here?

Mr. CUNNINGHAM. It is approximately 96 times.

Mr. RHYNE. Why do you vary the magnification?

Mr. CUNNINGHAM. The magnification of every photograph you take, sir, depends on the length of the bellows of the camera. The microscope will have a set magnification. But each time that you focus the length of the bellows can change, which will increase or decrease the magnification. Also with some photographs you mask off areas which are out of focus. You certainly would not want to print a whole negative where you have distortion. You bring into focus one small portion of the surface of that bullet.

If, say, one surface of the bullet is slightly flattened and the other surface is rounded—the rounded surface will be going out of focus much faster than the flattened side, and it would be very confusing. That is the type of thing. You mask differently.

Then when you have the negatives enlarged, you can enlarge one negative more than you do the other. So it can be based either on the length of the bellows, or on the amount you have enlarged it.

Mr. EISENBERG. Is that all the photographs?

Mr. CUNNINGHAM. No, there is one more.

This photograph is a photograph of the firing-pin impression of the C–49 cartridge case, and the firing-pin impression on the test from Oswald's revolver, and this is Commission document 600.

Mr. EISENBERG. And the magnification?

Mr. CUNNINGHAM. 120 times, approximately.

Now, here you have very distinctive marks, but it is much more difficult for a layman to pick them out. That is the reason I have circled these marks and

numbered them, 1, 2, 3, 4, 5, 6, on each side of the hairline. On the left is C–49, and on the right is the cartridge case obtained from C–143.

You have this very large, very distinctive imperfection.

Mr. EISENBERG. You are pointing to circle number 1?

Mr. CUNNINGHAM. In number 1. Also, in number 2, it looks like a little set of railroad tracks, and this one with the same shape coming down through. You can see this little piece and this little piece. Over here you have a real small "railroad track."

Mr. EISENBERG. That is number 3?

Mr. CUNNINGHAM. That is number 3. And it looks like a little hump or bump, and that is very distinctive.

There is a slight overlapping here, but you can see it is sort of a V shape—in number 4, very distinctive. Down here you have a Z line with a line through it, number 6. I only brought those out to show six of the similarities. If you go through you can pick out places in the firing-pin impressions, that are similar, by yourself.

Mr. EISENBERG. On the top of each of these photos, C–49 and C–15, there is a large comma-shaped indentation, or comma-shaped mark. What is that caused by, Mr. Cunningham?

Mr. CUNNINGHAM. That is caused by a very large imperfection—a very distinctive imperfection in the firing pin itself. And here it is.

Here I am looking at Commission document 601, the breech face and firing pin. If you will look at the firing pin in this photograph, you will see over on this side, this very large imperfection. It is like a facet—it is a flattened side. It shows up in the photograph of the firing pin.

It is indented—since it is missing from the firing pin, it will show as a flattened area in the firing-pin impression. In other words, what is concave on the firing pin itself, will be convex in the firing-pin impression.

Mr. EISENBERG. If there are no further questions on the cartridge cases, I will move on to the bullets.

Representative FORD. Mr. Boggs?

Representative BOGGS. Just one question. What you are saying is that there is no doubt about the fact that the cartridges that you examined came from this revolver?

Mr. CUNNINGHAM. That is correct.

Representative BOGGS. And, of course, there is no question about the fact that this was Mr. Oswald's revolver. Is that so?

Mr. EISENBERG. That will be proved, I hope, before the end of the hearings. This witness cannot himself testify.

Representative BOGGS. I understand that. I am asking you.

Mr. EISENBERG. There is no question, I don't think, about that. That will be the subject of testimony.

Representative BOGGS. I know—we are not following the exact rules of evidence around here.

Mr. EISENBERG. We will connect it up.

Representative BOGGS. In that connection—how many bullets were recovered?

Mr. EISENBERG. Four were recovered from the body of the officer. But as you will see from the testimony which we will get into right now, that doesn't mean four shots were fired, because there is a slight problem here. I would rather have the witness develop it.

Representative BOGGS. You are being very mysterious now, but it is all right.

Mr. EISENBERG. Mr. Cunningham, I hand you four bullets in plastic cases marked C–251, C–252, Q–13, and C–253, which have also certain other markings on them, and I ask you if you are familiar with these bullets.

Mr. CUNNINGHAM. I am.

Mr. EISENBERG. Are your marks on these bullets?

Mr. CUNNINGHAM. Yes, they are.

Mr. EISENBERG. For the record, I would like to state these four bullets were recovered from the body of Officer Tippit.

When did you receive these bullets, Mr. Cunningham?

Mr. CUNNINGHAM. The Q–13 bullet was delivered to the Laboratory the first

time on the morning of November 23d, and it was delivered to the Laboratory by Special Agent Vincent Drain of the Dallas office of the FBI.

Mr. EISENBERG. And the remaining bullets?

Mr. CUNNINGHAM. By the way, it was returned to Dallas, and then it was returned to the Laboratory, delivered again by Special Agent Vincent Drain, of the Dallas office, also, Special Agent Warren De Brueys. They delivered our Q–13 a second time on November 27th.

Representative FORD. When you say "our," what do you mean by "our"?

Mr. CUNNINGHAM. In other words, to facilitate reporting in the Laboratory, we usually give these items a Q or a K number. A Q number is a questioned item, like a bullet from a body, and a known is a gun, the K is a known, like a weapon.

That is for reporting purposes. But since this case began, we have so much evidence, and we have received so much evidence, it was considered practical to reassign a C number by us—like Mr. Eisenberg said, they are C–253, C–252, and C–251. They also have a Q number. Q–13 is C–13. That is the reason why I said "our" Q–13.

Mr. EISENBERG. When did you examine Q–13, Mr. Cunningham?

Mr. CUNNINGHAM. November 23d, the first time. That was when I made my examination. It was returned on the other date. But it was examined on 11–23.

Mr. EISENBERG. Now, Q–13 has in it a brass colored object, as well as a bullet—that is, the box containing Q–13, your Q–13.

Mr. CUNNINGHAM. Yes. That was identified as the button—the button—from the coat of Officer Tippit. The bullet struck that button and when the bullet was removed from the body, the button was also removed.

Representative BOGGS. Went right in?

Mr. CUNNINGHAM. Yes, sir. I have no first-hand knowledge. But that is what it was identified as.

Mr. EISENBERG. Mr. Chairman, I would like these four bullets admitted as 602, 603, 604, and 605.

Representative FORD. They will be admitted.

(The articles referred to were marked Commission Exhibits Nos. 602 through 605, and received in evidence.)

Mr. EISENBERG. When did you receive what are now marked 603, 604, and 605, Mr. Cunningham?

Mr. CUNNINGHAM. They were received in the FBI Laboratory on March 16th of this year, and they were submitted to the Laboratory by the Dallas office of the FBI.

Mr. EISENBERG. When were they examined?

Mr. CUNNINGHAM. They were examined on March 17, 1964.

Mr. EISENBERG. Can you explain the great time difference between the receipt and examination of the first bullet and the receipt and examination of the last three bullets?

Mr. CUNNINGHAM. At your request, you asked us to postpone the examination of these three bullets in order to facilitate other examinations you wished more expedited than the examinations of these bullets.

Mr. EISENBERG. Now you are explaining the time between the receipt and the examination?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. Now, can you explain why these three bullets——

Mr. CUNNINGHAM. Oh, between the first submission and the second?

Mr. EISENBERG. Yes; between the submission of the first bullet, and the submission to you of the second three bullets.

Mr. CUNNINGHAM. Well, it is my understanding the first bullet was turned over to the FBI office in Dallas by the Dallas Police Department. They reportedly said this was the only bullet that was recovered, or that they had. Later at the request of this Commission, we went back to the Dallas Police Department and found in their files that they actually had three other bullets.

Mr. EISENBERG. Now, did you examine these four bullets to determine whether they had been fired in the revolver, Exhibit No. 143, to the exclusion of all other weapons?

Mr. CUNNINGHAM. I am sorry.

Mr. EISENBERG. Did you examine the four bullets which have just been marked into evidence to determine whether those four bullets had been fired in the revolver, No. 143?

Mr. CUNNINGHAM. I did.

Mr. EISENBERG. And can you give us your results, your conclusions?

Mr. CUNNINGHAM. Yes, sir.

First of all, Commission Exhibit 602, which is our Q–13 bullet, I found to be a .38 Special, copper-coated lead bullet of Western-Winchester manufacture which had been fired from a barrel having five lands and grooves, right twist. I also found the other three bullets——

Mr. EISENBERG. 603——

Mr. CUNNINGHAM. 603, 604, and 605, Commission Exhibits, which are C–253, C–252, and C–251, respectively. I found that 251 and C–253——

Mr. EISENBERG. Could you give us the Commission numbers?

Mr. CUNNINGHAM. Commission Exhibits 605, 603, they, too, were .38 Special copper-coated lead bullets of Winchester-Western manufacture, which had been fired from a barrel having five lands and grooves, right twist.

The grooves in the barrel ran in a right-hand direction, a right twist.

Mr. EISENBERG. That accounts for three bullets.

Mr. CUNNINGHAM. Yes.

And Commission Exhibit 604, which is C–252, is a .38 Special Remington-Peters lead bullet, which has been fired from a barrel having five lands and grooves, right twist.

Mr. EISENBERG. Winchester-Western, you say?

Mr. CUNNINGHAM. No, sir; that is Remington——

Mr. EISENBERG. Let's go over that.

We have 603——

Mr. CUNNINGHAM. 602, 603, and 605 are your copper-coated lead bullets of Winchester-Western manufacture.

Mr. EISENBERG. And 604?

Mr. CUNNINGHAM. And 604 is a Remington-Peters lead bullet.

Mr. EISENBERG. Now, were you able to determine whether those bullets have been fired in this weapon?

Mr. CUNNINGHAM. No; I was not.

Mr. EISENBERG. Can you explain why?

Mr. CUNNINGHAM. Yes, sir.

First of all, Commission Exhibit No. 602 was too mutilated. There were not sufficient microscopic marks remaining on the surface of this bullet, due to the mutilation, to determine whether or not it had been fired from this weapon.

However, Commission Exhibits 603, 604, and 605 do bear microscopic marks for comparison purposes, but it was not possible from an examination and comparison of these bullets to determine whether or not they had been fired—these bullets themselves—had been fired from one weapon, or whether or not they had been fired from Oswald's revolver.

Further, it was not possible, using .38 Special ammunition, to determine whether or not consecutive test bullets obtained from this revolver had been fired in this weapon.

Mr. EISENBERG. Do you have an opinion as to why it was impossible to make either type of determination?

Mr. CUNNINGHAM. Yes, sir; this weapon, using .38 Special bullets, was not producing marks consistent with each other. Each time it was fired, the bullet would seem to pass down the barrel in a different way, which could be due to the slightly undersized bullets in the oversized .38 S&W barrel. It would cause an erratic passage down the barrel, and thereby, cause inconsistent individual characteristic marks to be impressed or scratched into the surface of the bullets.

Representative FORD. When you say this weapon, will you identify what you mean by "this weapon"?

Mr. CUNNINGHAM. This particular revolver, Commission Exhibit 143.

Mr. EISENBERG. So this brings us back to your earlier testimony, that the

gun had been rechambered for a .38 Special, which is slightly smaller in one respect than the .38 S&W, but it had not been rebarreled for the .38 Special?

Mr. CUNNINGHAM. That is correct.

The original .38 Smith and Wesson barrel is still on the weapon.

Mr. EISENBERG. So that the .38 Special, when fired in that gun, might wobble slightly as it passes through the barrel?

Mr. CUNNINGHAM. I don't know if wobble is the correct word. But as the bullet is passing down this shortened .38 barrel, we are probably getting an erratic passage, so the marks won't reproduce.

Mr. EISENBERG. Is it possible to say that the bullets were not fired from this weapon, No. 143?

Mr. CUNNINGHAM. No, it is not; since the rifling characteristics of Commission Exhibit 143—this revolver—are the same as those present on the four bullets.

Mr. EISENBERG. Now, you said that there were three bullets of Winchester-Western manufacture, those are 602, 603, and 605, and one bullet of R.-P. manufacture.

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. However, as to the cartridge cases, Exhibit 594, you told us there were two R.-P. cartridge cases and two Western cartridge cases.

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. So that the recovered cartridge cases, there is one more recovered R.-P. cartridge case than there was recovered bullet?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. And as to the bullets, there is one more recovered Winchester-Western bullet than there is Winchester-Western cartridges?

Mr. CUNNINGHAM. That is correct.

Representative BOGGS. How would you account for that?

Mr. CUNNINGHAM. The possibility exists that one bullet is missing. Also, they may not have found one of the cartridge cases.

Representative BOGGS. Are you able to match the bullet with the cartridge case?

Mr. CUNNINGHAM. It is not possible.

Representative BOGGS. So that while you can establish the fact that the cartridge case, the four that we have, were fired in that gun——

Mr. CUNNINGHAM. Yes, sir.

Representative BOGGS. You cannot establish the fact that the bullets were fired in that gun?

Mr. CUNNINGHAM. That is correct.

Representative BOGGS. And you cannot—having the cartridge case and the bullet—you cannot match them up?

Mr. CUNNINGHAM. No, you cannot.

Representative BOGGS. There is no way to do it?

Mr. CUNNINGHAM. No; other than what I have said. In other words, you can tell manufacture. But there is no way of—that I know of—of connecting or identifying a particular bullet having been loaded into a particular cartridge case.

Representative BOGGS. But there is no doubt about the fact that the four cartridge cases came from firing in that weapon?

Mr. CUNNINGHAM. They were fired in that weapon to the exclusion of all other weapons.

Mr. EISENBERG. Now, when you said before that you would be missing a bullet—under the explanation you gave—would you be missing both a bullet and a cartridge case?

Representative BOGGS. Excuse me, before you answer that question. What testimony have we developed with reference to this delay in the transmission of these bullets to either the FBI or to the Commission?

Mr. EISENBERG. Just what you have heard. Would you like to have it developed further?

Representative BOGGS. Well, is this within his competence?

Mr. EISENBERG. I do not think so. I can state for the record myself that about 2 weeks ago I requested—I made a request of Mr. Conrad, who is the

Assistant Director in charge of the FBI Laboratory—that the three Tippit bullets which had not theretofore been examined, be examined. At that point they had not yet been sent from the Dallas Police to the FBI, and no request had apparently been made for them.

Representative BOGGS. Well, the FBI obtained one almost immediately.

Mr. EISENBERG. Yes.

Representative BOGGS. And then there was how long a delay before the other three?

Mr. EISENBERG. You have the dates there, Mr. Cunningham?

Mr. CUNNINGHAM. The date was—we obtained the first one on November 23, 1963, and then——

Representative BOGGS. The day after the killing of Officer Tippit?

Mr. CUNNINGHAM. Yes; it was delivered at the same time as all the other material. And then it was returned November 17, 1963.

As far as the FBI is concerned, sir, we have no jurisdiction in that case. We were doing the lab work for the Dallas Police Department, but in the investigation of the death of Officer Tippit we do not have jurisdiction.

Representative BOGGS. How did the Commission ascertain that these additional bullets were there?

Mr. EISENBERG. Well, upon review of the underlying materials, it developed that while one bullet had been taken out of Officer Tippit as soon as he got to the hospital, which was apparently the first bullet, the one examined November 23, three further bullets were taken out at the autopsy. And since we knew that only one bullet had been examined by the FBI, and since we knew at that point that three further bullets had been taken out, we asked that those three further bullets be examined.

Representative BOGGS. What proof do you have though that these are the bullets?

Mr. EISENBERG. Well, again, we will have to connect it up at a subsequent time. They were turned over to the FBI Dallas Office, were they, Mr. Cunningham?

Mr. CUNNINGHAM. That is correct.

Representative BOGGS. I am talking about the three bullets now, not the first bullet.

Mr. EISENBERG. Yes; turned over to the FBI Dallas Office by the Dallas Police. Now, we will have to connect up by deposition or testimony before the Commission on the origin of those bullets, and proof is not in the record now, as it is not in the case of many of these items, as to origin. However, I have no doubt that we will be able to connect it up and put it all in the record.

Representative BOGGS. Has there been any inquiry made as to why there was this delay in removing the other three bullets to the FBI?

Mr. EISENBERG. Well, as Mr. Cunningham stated, I was told since this was not within the jurisdiction of the FBI, they would only examine evidence which was given to them.. And since it had not been given to them, they had not examined it.

When I asked for it, there was a formal request made for them, and they made their examination at that point.

Is that your understanding, Mr. Cunningham?

Mr. CUNNINGHAM. That is correct, sir. In other words, we will do laboratory examinations for any duly constituted law-enforcement agency upon request. And we did it in this case. We offer our facilities but do not go out and ask for work. Since we have no jurisdiction in the killing of Officer Tippit, we would make no investigation and therefore, we would have no reason to go and ask for additional bullets, until of course this Commission asked us to, and then we did on behalf of the Commission.

Representative BOGGS. Do you have any theory, and this is just a theory, you understand, as to this discrepancy in these results as compared to the cartridge cases?

Mr. CUNNINGHAM. Inasmuch as there are three Western bullets, you would be missing one Western cartridge case, and one Remington bullet. You are missing one of each. He could have missed one of the shots. I do not know how many times he actually fired the weapon. But he could have missed once. It is very

possible that he could have. And depending on the angle, it would be very difficult to find that bullet unless it struck some close intervening object. Also I have no first-hand information, again, but I believe that some neighbor turned in these cartridge cases to the Dallas Police Department.

Mr. EISENBERG. I believe that is correct.

Mr. CUNNINGHAM. You have received a letter from the Dallas office of the FBI just recently, I believe, setting forth that information.

Representative BOGGS. That would account for one. There would still be another one, would there not?

Mr. CUNNINGHAM. There would be just one cartridge case missing.

Mr. EISENBERG. Is there any other logical theory which could explain the results?

Mr. CUNNINGHAM. Of course, he could have had an empty cartridge case remaining in the weapon at the time he fired it. Then he would only have fired four shots, and then a bullet is still unaccounted for. That would explain it also.

Mr. EISENBERG. In other words, if he had an unejected R-P cartridge case?

Mr. CUNNINGHAM. No—a Western.

Mr. EISENBERG. You mean an unejected Western cartridge case?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. And he fired two Winchester and two R-P bullets—now in that case—and, if he then ejected he would get three Winchester and two R-P bullets, would he not—that is, cartridge cases—if he had an extra cartridge case?

Mr. CUNNINGHAM. If he had an extra cartridge case——

Mr. EISENBERG. He would get five cartridge cases?

Mr. CUNNINGHAM. In other words, if he had an extra cartridge case, say a Remington——

Mr. EISENBERG. I was right the first time. Suppose he has an extra Remington?

Mr. CUNNINGHAM. Well, then you would have lost a Western. If he fires four times?

Mr. EISENBERG. Yes?

Mr. CUNNINGHAM. And he has the fifth one in. You would still have to have three Western cartridges loaded in and one Remington cartridge.

Mr. EISENBERG. But then——

Mr. CUNNINGHAM. Which is four.

Mr. EISENBERG. But then you only have to lose one cartridge case. You do not have to lose a bullet and a cartridge case.

Mr. CUNNINGHAM. That is right. You do have to lose one case.

Mr. EISENBERG. And the case you lose would be a Western case?

Mr. CUNNINGHAM. That is correct. Western.

Representative FORD. Is it unusual to have a mixture of this kind in a pistol?

Mr. CUNNINGHAM. Yes, sir. Usually they are all the same brand. Although if you have two boxes—.38 Special cartridges come in boxes of 50. And you will see hand-loaders once in a while. By the way, we found no indication that they had been hand loaded.

Representative BOGGS. Is this a police weapon as well?

Mr. CUNNINGHAM. Yes; and a very good one. Not in that particular caliber. In other words, the caliber——

Representative BOGGS. That is what I meant.

Mr. CUNNINGHAM. .38 S&W is not a popular cartridge in this country. The .38 Special is.

Representative BOGGS. .38 Special is?

Mr. CUNNINGHAM. Yes, sir. That cartridge.

Representative BOGGS. With police forces?

Mr. CUNNINGHAM. We use it. Most of your larger police forces use the .38 Special. It is a better cartridge.

Mr. EISENBERG. Getting back to the example we were using before as a second possible theory—the cartridge case that would be lost would be a Western case, I believe actually?

Mr. CUNNINGHAM. Yes, it would be a Western case.

Mr. EISENBERG. Now, also getting back to a subject we were discussing, I will

quote in part from a letter from Mr. Hoover to Mr. Rankin dated March 31, 1964.

"On March 30, 1964, Mr. Eisenberg requested that the Dallas Police Department be contacted to determine whether any additional cartridge cases had been recovered." And I say parenthetically I mean in addition to the four which we have seen here.

"On March 30, 1964, Lieutenant Carl Day, Dallas Police Department, advised the Dallas office of this Bureau that all of the cartridge cases and bullets recovered had been previously submitted to the FBI."

You mentioned or discussed the question of hand loading. Can you describe what you mean by hand loading?

Mr. CUNNINGHAM. Hand loading is nothing more than taking components and by means of a press you make your own cartridges. You put them together.

Mr. EISENBERG. In this process, would you be able to take a bullet of one manufacturer and a cartridge case of another?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. You said that you found no evidence that that had been done in this case?

Mr. CUNNINGHAM. We found no sizing marks on the cartridge cases, which after the first time it has been fired, you many times have to resize it, due to the fact that one chamber can be too large. They always full-length resize, for in a police department many officers will be using this ammunition. You might not resize if one were only firing them in one gun. In other words, you are limiting the chambers of your cylinder that they will fit into. But normally they are full-length resized, and from this you get these sizing marks. Actually they are scrape marks from the sizing die.

Mr. EISENBERG. In a hand-loading operation, is the equipment needed bulky or small?

Mr. CUNNINGHAM. It is quite bulky.

Mr. EISENBERG. If Oswald had hand-loading equipment, would it have been likely to have been turned up among his personal effects? Could it be easily missed?

Mr. CUNNINGHAM. You could not miss it; no, sir.

Representative FORD. When you say bulky——

Mr. CUNNINGHAM. A "C" press or an "O" press will stand anywhere from 10 to 12 inches high with a 2-foot handle. Your turret-type would run almost a foot and a half high above the table. And they are all made very heavy because of your full-length resizing—not only on your small revolver cartridges, but for all your hunting cartridges—that takes great pressure. They are heavy duty. And you need quite a bit of equipment. Most of the time there will be a case trimmer, your complete press—there is a primer press, and then you have to have dies for the cartridge you are loading—your sizing dies and your bullet dies that you use to press the bullet into the cartridge case. Then there are all sorts of sundry equipment that go along with hand loading—your powder measurer, which is usually quite large if it is one that will do it volumetrically. True, you can have a balance and weigh out a particular amount for each one, but it takes an awful lot of time. Normally they are volumetric powder measures. You tip it and it puts a certain amount of powder into the cartridge case.

Representative FORD. Is it expensive equipment to buy?

Mr. CUNNINGHAM. Originally, yes. Comparatively so. A good press, I think you can buy one anywhere from $29 to over $100. You will have to invest, I would say, $150 to have a fairly good outfit. But over the years it is a cheap investment. Instead of paying $2.80 a box, or $2.85 a box, you are turning out cartridges, once you have your brass, for—even rifle, hunting cartridges—for about 7 cents, and lead bullet cartridges down to around 3 cents apiece.

Representative FORD. $2.80 a box?

Mr. CUNNINGHAM. I have the component list here from Western. I do not have the cost per box of ammunition, but it can run anywhere from $2.25 all the way up to $6 to $8 for some of your larger hunting rifle cartridges—boxes of 20 in hunting ammunition, boxes of 50 in your revolver and pistol ammunition.

Even buying components, it is comparatively cheap. If you buy them by the hundred, and they will run, for instance the .38 Special, 158 grain lead bullets per hundred, only $2.80, and that is for original components. If you have the

brass, your powder cost is negligible—probably a penny a cartridge, half a cent a cartridge for a .38 Special. So it saves you so much money if you are a target shooter, for instance, it is advantageous to do it if you like to shoot.

Mr. EISENBERG. Is that a skilled operation, hand loading?

Mr. CUNNINGHAM. Basically, no. Once you have the basic—if you do any reading on it, and you take your time, and are very careful, it is not a difficult operation at all.

Mr. EISENBERG. Now, would a——

Representative BOGGS. How are these cartridges loaded mechanically—not like this hand loading.

Mr. CUNNINGHAM. It is all done on large machines. They buy their lead, for instance, in rods. They ask for a lead alloy of a certain hardness. Then these machines—they feed in the rods in the bullet-making machines, and they cut them off to length. They have different diameter rods. For a .38 the rod diameter would be approximately .357'' or .358''. Then this machine comes down in a swaging operation.

Another machine puts the knurling around—forming the lubricating grooves, and another groove. They tumble out as fast as the machine can run.

Then you have your case formation. They buy their cases—they look like little cups of copper. Actually it is a copper alloy. And then you go through a drawing process, and then an annealing, and a drawing and annealing, and a drawing and annealing of these brass cases. And then once you get them to approximate length, you full-size them and form the cases. The machine keeps tumbling them out.

And a small lathe—as these cases are going around—turns the case and puts in the extraction groove—all automatically. Another machine comes up from the bottom and puts the head stamp in. Another one is a drilling operation, and it puts in the holes for the primer and also the flash holes into the case. All done automatically. And they tumble into a big box.

Then they take those components and they put them on the line. The primers are all done by hand, except for shotgun primers at Western.

There are girls sitting at these presses who do 50 or 100 at a time. They put guide plates into the machine in which the girls put the primers. They are automatically loaded. All the primers are put in by hand, in essence.

Mr. EISENBERG. Mr. Cunningham, what is the advantage of hand loading in terms of cost, if you do not have your own shells to start with?

Mr. CUNNINGHAM. There again your initial cost is fairly expensive. For instance, for the .38 Special, unprimed cases, the list price per hundred last year, was $4.60 a hundred. The primed cost $5. The primers cost 20 cents——

Mr. EISENBERG. So there is a saving even if you do not provide your own shells?

Mr. CUNNINGHAM. Oh, yes—and the bullets would cost——

Mr. EISENBERG. How many primers?

Mr. CUNNINGHAM. One hundred. And 158 grain lead, .38 Special bullets are $2.80. So $7.80 plus $2.00 worth of powder and you are in business.

Mr. EISENBERG. For $9.80?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. And how much would the bullets cost you if you bought them commercially already prepared?

Mr. CUNNINGHAM. I think it is $2.50 per 50.

Mr. EISENBERG. Well, that is more. $2.25 per 50, did you say?

Mr. CUNNINGHAM. $2.85? I never buy any ammunition of that type. I do not know.

Mr. EISENBERG. So for a hundred that would be $5.90.

Mr. CUNNINGHAM. I would say it is closer to $8 per hundred for .38 Special.

Mr. EISENBERG. So it is cheaper to buy them that way than to buy the components?

Mr. CUNNINGHAM. It is cheaper to buy your components when you do not have to buy the cartridge cases.

Mr. EISENBERG. Well, now, is it possible that a gunsmith would buy the components, including new cases, and reload together a case from Western-Winchester and a bullet from Remington-Peters?

Mr. CUNNINGHAM. I don't think that a gunsmith would buy the new cases. That is what I was saying. For instance, used .30–.06 brass, right here in town—you can buy it locally. You can buy National Match Cases, which are excellent brass. I think they are a nickel a piece; $5 a hundred.

Mr. EISENBERG. Are they as good as the new cases?

Mr. CUNNINGHAM. They are once-fired cases. They are excellent.

Mr. EISENBERG. So in you opinion does the possibility that this discrepancy in bullets and cartridge cases can be explained in terms of reloading make much sense? Does it have a high degree of probability or a low degree of probability, would you think?

Mr. CUNNINGHAM. I am sorry.

Mr. EISENBERG. Would you think it probable or improbable, in light of all your testimony, that the discrepancy between the number of recovered bullets and the number of recovered cartridge cases can be explained in terms of a reloading operation of some kind, or hand loading?

Mr. CUNNINGHAM. No, sir; I do not. It is improbable, because we found no indication of any reloading operation. And in an examination of all the cartridges that we had examined, there was no indication of a reloading operation on those. They looked like factory bullets and factory cases.

Mr. EISENBERG. And if you were going to reload, you would use used cartridges rather than new ones?

Mr. CUNNINGHAM. You would use used brass, because you usually can pick it up at ranges and places like that. You would not even have to buy it.

Representative BOGGS. By that you mean you would use these? (Referring to Commission Exhibit No. 595.)

Mr. CUNNINGHAM. Yes, sir; well—these would be very difficult—in other

Mr. CUNNINGHAM. Yes, sir; well—these would be very difficult on account of the case. They would be hard to resize on account of the fact the case is pushed out due to the rechambering. But they could be used; yes, sir.

Mr. EISENBERG. When you say there is no indication, would there be an indication if they were resized?

Mr. CUNNINGHAM. Yes; usually—unless the sizing die was extremely clean—usually you will get your resizing marks from the resizing die.

Mr. EISENBERG. And in particular you say the cartridge cases from this particular weapon show a substantial amount of bulge?

Mr. CUNNINGHAM. They do. As you brought to my attention, there is a crack in the one case. I would not care to use this type of brass if I were hand loading. I would find brass that had been fired in a .38 Special.

Mr. EISENBERG. Now, by the way, the various cartridge cases, the four cartridge cases and four bullets that you have identified, and that you obtained from your Dallas Office and other sources, that is, Exhibits 594 and 602, 603, 604, and 605, are these now in the same condition as they were when you originally got them?

Mr. CUNNINGHAM. Substantially. A small sample was taken off the noise which was run spectrographically. But the major portions of all these bullets are the same as when they were received in the laboratory.

Mr. EISENBERG. Did you clean them in any way or alter them?

Mr. CUNNINGHAM. Yes; we had to clean them. They were removed from the body and were bloody. You could not see the surfaces. We had to put them in haemo-sol, which is nothing more than a material that will take out the blood.

Mr. EISENBERG. Is that true of all four bullets? That is true of the last three bullets as well as the original bullet?

Mr. CUNNINGHAM. Q–13 was cleaned of blood tissue in haemo-sol. I do not think I have anything in the notes that the last three were cleaned at all.

Mr. EISENBERG. Would that indicate they were not cleaned?

Mr. CUNNINGHAM. I would say so, because I would have put it down.

Mr. EISENBERG. Was the substance removed from the first bullet tested to see whether it was blood, or did you just assume it was blood?

Mr. CUNNINGHAM. No examination was made of it.

Mr. EISENBERG. Was there any dirt on the cartridge case?

Mr. CUNNINGHAM. I don't remember any.

Mr. EISENBERG. Would your notes show if you had cleaned it up?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. And they do not show any cleaning up?

Mr. CUNNINGHAM. No.

Mr. EISENBERG. You said these revolver bullets were sold in boxes of how many?

Mr. CUNNINGHAM. Fifty.

Mr. EISENBERG. Will a storekeeper, a gun man who sells bullets, sell less than 50 usually, in your experience?

Mr. CUNNINGHAM. Maybe some small outfit would. But I just don't know of any around here that will.

Mr. EISENBERG. Now, Oswald was found with two types of ammunition, two makes of .38 Special cartridges. Would you infer than that——

Representative BOGGS. What two types?

Mr. EISENBERG. R.-P., or Remington-Peters, and Western-Winchester.

Mr. CUNNINGHAM. They were Westerns.

Mr. EISENBERG. Would you infer on the basis of your previous statement that he had probably bought a larger quantity?

Mr. CUNNINGHAM. The inference would be that he had at least two boxes.

Mr. EISENBERG. At some point?

Mr. CUNNINGHAM. Yes; either that or he had obtained them from another individual.

Mr. EISENBERG. How about the rifle ammunition, this 6.5 Mannlicher-Carcano rifle ammunition—how is that commonly sold—the Western brand?

Mr. CUNNINGHAM. That would depend on the surplus house, how it is sold.

Mr. EISENBERG. You think that might be sold in less than fixed minimum quantities?

Mr. CUNNINGHAM. Many times that type of ammunition, surplus ammunition, is sold in any amount. They will give a single price, single cartridge price—or they will take off some if you buy them by the thousand or the hundred. That is a lot different than commercially made ammunition for sale in this country.

Mr. EISENBERG. Mr. Chairman, I would like to examine this witness now on the paraffin test, if there are no further questions on the areas we have been covering up to now.

Representative FORD. Any questions, Mr. Boggs?

Representative BOGGS. I don't think so.

Representative FORD. Mr. Rhyne?

Mr. RHYNE. Yes; you said that you were positive that these cartridge cases that were found near where Officer Tippit was killed, and which are over in front of Representative Boggs now, were fired in this gun.

Mr. CUNNINGHAM. As I stated the first time, in my opinion those cartridge cases were fired in that particular weapon to the exclusion of all other weapons.

Mr. RHYNE. And with respect to the bullets that were found in the body of Officer Tippit, you testified that you could not be positive that they were fired by this weapon, Exhibit 143.

Mr. CUNNINGHAM. I could not identify those bullets as having been fired from that gun. However, the rifling characteristics on the bullets are the same as produced by that weapon. Also, I could not identify consecutive tests obtained from that revolver, using .38 Special ammunition, and I could not identify, even though there are microscopic marks on three of these bullets for comparison purposes—I could not identify them with each other.

Mr. RHYNE. Now, based on your many, many years of experience, is this usual or unusual, that you are unable to identify bullets from such a gun under these circumstances?

Mr. CUNNINGHAM. It is not unusual in this particular case. I have had other cases with these rechambered .38 S&W revolvers, that are rechambered to a .38 Special; it is not unusual to not be able to identify them. And especially when the barrel has been cut off 2¾ inches, it even cuts down the possibility a little bit more.

Mr. RHYNE. I was under the impression that you people down at the FBI could identify almost any bullet as coming from almost any gun. That is not strictly true, then?

Mr. CUNNINGHAM. Thank you, but it is not.

Representative BOGGS. How much has this barrel been cut off?

Mr. CUNNINGHAM. About 2¾ inches. You measure the length of the barrel from—you see the cylinder——

Representative BOGGS. Yes.

Mr. CUNNINGHAM. And the portion coming out from the frame, that is a portion of the barrel. And the barrel is measured from there to the muzzle. And the barrel now is 2¼ inches long. The original barrel was 5 inches long—or at least it is similar to the model that would have a 5-inch barrel.

Representative BOGGS. What is the advantage of reducing the length of the barrel?

Mr. CUNNINGHAM. Two things—sales appeal and concealment.

Representative BOGGS. Does it affect the firing quality of the weapon?

Mr. CUNNINGHAM. It affects your accuracy inasmuch as it cuts down on your sight radius. Your longer barrel will be more accurate than a shorter barrel, due to the longer sight radius. The reason that rifles are inherently more accurate than a hand weapon is due, in part, to the longer sight radius. That is the reason the farther you can get away from the sight when you are firing a revolver, the more accurate. Lengthening your sight radius will increase the accuracy.

Mr. RHYNE. Based on your experience in your study of these bullets, do you have an opinion as to whether or not they were fired by this gun?

Mr. CUNNINGHAM. No, sir; I cannot determine that.

Mr. RHYNE. You have no opinion at all?

Mr. CUNNINGHAM. The only thing I can testify to, is they could have, on the basis of the rifling characteristics—they could have been. However, no conclusion could be reached from an actual comparison of these bullets with test bullets obtained from that gun.

Mr. RHYNE. Even though there are a lot of similar markings.

Mr. CUNNINGHAM. There are not; no, sir. There are not a lot of similar markings. They are similar. The rifling characteristics, are the same, or similar. But, in the individual characteristic marks, there are not a lot of similarities. There are not sufficient similarities to effect an identification.

Representative BOGGS. Stating Mr. Rhyne's question negatively, these bullets could have been fired by another weapon?

Mr. CUNNINGHAM. That is correct. Either this weapon or another weapon which has the same rifling characteristics.

Representative FORD. You are limiting that to the bullets now?

Mr. CUNNINGHAM. The bullets.

Mr. RHYNE. Yes; my question related just to the bullets.

Mr. CUNNINGHAM. I identified the cartridge cases.

Mr. RHYNE. He was positive about the cartridge cases, but not about the bullets.

Representative BOGGS. Now, would it be likely to find these cartridge cases, which you can positively identify as having been fired from this weapon—would it be likely that these bullets which you cannot identify as having been fired from this weapon—would it be likely that they would be fired from another weapon under those circumstances?

Mr. CUNNINGHAM. Well, that, sir, depends on other extraneous facts other than my comparisons and examinations. In other words, I can only testify to what I actually found from an examination and comparison of those bullets with these test bullets from that gun. And as to anything else, I cannot testify. I mean—that would be based upon other facts.

Mr. EISENBERG. Carrying some of these questions a little bit further, Mr. Cunningham, you say that this bullet could have been fired from this gun, and was fired from a gun with these rifling characteristics?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. Which you said were five lands, five grooves, right twist?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. What about the widths of the lands and grooves? Did you measure those?

Mr. CUNNINGHAM. Yes; they were also the same. In other words, when I say it has similar rifling characteristics—the widths of the lands and the grooves is taken into account the rifling characteristics. It has the same width and number of lands and grooves and a right twist.

Mr. EISENBERG. Now, how many other—well, before I ask that, you have also established that the bullets were .38 Specials?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. And the manufacturer of each bullet?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. Would you say they had been fired therefore from a gun chambered for a .38 Special?

Mr. CUNNINGHAM. Yes; there was no indication that they were fired in a weapon other than .38 caliber.

Mr. EISENBERG. So that the weapon was a .38 Special weapon with five lands, five grooves, right twist, and with the same dimensions for each land and each groove.

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. Now, would the entire production run of this model conform to that description?

Mr. CUNNINGHAM. Yes. And also there are other models.

Mr. EISENBERG. Other models also produced by Smith and Wesson?

Mr. CUNNINGHAM. Yes; in .38 Special.

Mr. EISENBERG. Could you estimate the number of those guns?

Mr. CUNNINGHAM. May I have the NRA reprint? My estimate comes from the figures that are set forth in Commission Exhibit 593, which states that by 1942 there were a million "Military and Police" revolvers, which is the prior model to the Victory model, which they produced.

Representative BOGGS. That is this model?

Mr. CUNNINGHAM. No, sir. But the model has similar rifling characteristics. You could not distinguish between them. In other words, one is a commercially made gun—this is strictly a wartime gun. Also production of the "S" series continued until 1948, when the "C" series was started, including over one million "M&P" models, including the Victory model, which was this model, were manufactured between 1942 through March of 1948; and since that date, Smith and Wesson has produced over 500,000 "M&P" revolvers in the "C" series, which, when you add them up—there are over two and a half million.

Mr. EISENBERG. Two and a half million?

Mr. CUNNINGHAM. Over 2½ million.

Mr. EISENBERG. Now, apart from specially handmade or equivalent weapons, how many other types of weapons have you encountered which have these rifling characteristics?

Mr. CUNNINGHAM. Other than possibly a Spanish-made copy of the Smith—the Smith is the only one in .38 Special now that will have similar rifling characteristics.

Mr. EISENBERG. Now, when you say Spanish-made, you are referring to the basement type of operation?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. Now, this weapon did not produce, and does not produce—that is, the weapon 143—does not produce identical microscopic characteristics from bullet to bullet, you have testified. And you have told us that the reason might be that the weapon was rechambered but not rebarrelled, so that the .38 Special is slightly undersized for the barrel?

Mr. CUNNINGHAM. It has not been rebarrelled.

Mr. EISENBERG. That's right. So when you fire a .38 Special, it is slightly undersized, and this might affect the barrel characteristics? Wasn't that your testimony? That the .38 Special is slightly undersized?

Mr. CUNNINGHAM. Yes; approximately four-thousandths of an inch.

Mr. EISENBERG. Now, could you therefore limit the number of possible weapons from which the bullets might have been fired, not only to the 2½ million

S&W's which you discussed, plus the possibility of Spanish homemade weapons, but also to those weapons, that subcategory of weapons within those 2½ million, which does not produce microscopic characteristics such that you can identify bullets fired from them?

Mr. CUNNINGHAM. No, sir; you cannot, due to the fact that there was also the possibility that the inability to identify consecutive tests from that weapon could be caused from an accumulation of lead or from barrel wear—the barrel was actually physically changing.

Mr. EISENBERG. That is not quite what I meant. Out of every ten S&W .38 Specials, on the basis of your experience, how many do you think would produce rifling characteristics such that you could identify bullets fired from them?

Mr. CUNNINGHAM. Well, you could tell if the rifling characteristics are similar. But as far as the individual characteristic marks, that would be on an individual basis. Much depends on the imperfections in the barrel. Now, if you have some real deep imperfections in a barrel, it would be possible to pick them up each time. Even though you would have a lot of dissimilarities, the similarities would be so distinctive that there is always a possibility you could identify them. But not this weapon.

Mr. EISENBERG. Mr. Rhyne asked before whether it was usual or unusual to get this type of weapon not producing microscopic characteristics such that you could identify the bullet to the gun. You said it was not unusual.

Mr. CUNNINGHAM. It is not unusual.

Mr. EISENBERG. Now, I say out of every 10 such weapons, how many would you expect to be in this condition—that is, in a condition such that you cannot make an identification?

Mr. CUNNINGHAM. I would have no way of knowing that.

Mr. EISENBERG. On the basis of your experience, the experience that led you to say it is not unusual to have this condition?

Mr. CUNNINGHAM. I can only say that you find them, that you cannot identify them, so it is not unusual. But as to numbers, I could not say. When you go back and you take all the hundreds and hundreds of examinations I have made, it is not unusual. But I also will not say that it is usual. I will go to the negative, I will say it is not unusual.

Mr. EISENBERG. Would you agree that out of the 2½ million possible weapons it could only have been fired from a gun which will not produce microscopic characteristics such that you can identify the bullet to the weapon?

Mr. CUNNINGHAM. There is a good indication of that; yes. However, there is mutilation on all four of the bullets. But the three we are talking about, the ones that had marks for comparison purposes, now, even though the possibility is remote, it is still possible that there is mutilation in different areas of each bullet, so you would not be able to identify them. Even if the bullets—even if they had not been mutilated, you maybe still could not identify them. In other words, your mutilation on different parts of each bullet would preclude the possibility of identifying them with each other. So I cannot answer your question positively.

Mr. EISENBERG. Well, Mr. Chairman, I have one subject remaining with this witness. Mr. Cunningham, are you familiar with the paraffin test?

Mr. CUNNINGHAM. I am.

Mr. EISENBERG. Have you administered this test?

Mr. CUNNINGHAM. I have.

Mr. EISENBERG. Can you give us the approximate number of times you have administered it?

Mr. CUNNINGHAM. I don't know the exact number, but I must have performed this test at least 100 times, and probably more.

Mr. EISENBERG. Now, I will state for the record—I know you do not know of this of your own knowledge, Mr. Cunningham—but a paraffin test was performed on Lee Harvey Oswald by the Dallas Police. Three paraffin casts were made, one of the right cheek, one of the right hand, and one of the left hand. There was no reaction on the paraffin test of the right cheek. There was a reaction on the paraffin test of each of the right and left hands.

I will now hand you a sketch which was made by a participant in those tests, which shows the distribution of the blue or violet dots which constitute a positive reaction to this test on the left and right hands of Lee Harvey Oswald.

Representative BOGGS. Before you do that, Mr. Cunningham, will you describe briefly the procedure on a paraffin test? I want to understand exactly what it is.

Mr. CUNNINGHAM. The so-called paraffin test is the making of reinforced paraffin casts, of a person's hands, and then treating either with either one of two reagents. One is diphenylamine, and the other is diphenylbenzidine.

Representative BOGGS. Is that when the cast is on?

Mr. CUNNINGHAM. That is definitely after it is removed.

Representative FORD. You actually make a cast of the individual's hand?

Mr. CUNNINGHAM. Oh, yes.

Representative BOGGS. You make the casts. Then you take the casts off.

Mr. CUNNINGHAM. You slit it.

Mr. EISENBERG. Can you describe how the cast is made?

Mr. CUNNINGHAM. Yes. You first take warm paraffin. Each paraffin melts at a slightly different temperature. What we were using in our tests melts at about 130°. And this hot paraffin is placed on the hands. It is spread on with a brush, or it can be poured over. If you are sure that your brush is absolutely clean and will not react—and we checked all of our equipment so that we were not getting a reaction from the diphenylbenzidine—we let it pour on from the brush. Once you get a coating, you can just brush it on, because then you won't be disturbing any materials on the hands. And after you get a coat on, you take gauze bandages and lay them on top and put more paraffin on them. The gauze does nothing more than to give it reinforcement so it won't fall apart or crumble when it gets real cool. Then you cut them off the hands after they cool. Then they are chemically processed with either diphenylamine or diphenylbenzidine.

Representative BOGGS. The cast?

Mr. CUNNINGHAM. Yes; the portion of the cast next to the hand.

Representative BOGGS. Right. I understand now.

Mr. EISENBERG. Can you explain why paraffin is used? What is the action of the paraffin?

Mr. CUNNINGHAM. Well, the warm paraffin has the effect of opening up the pores of the skin and many times material that you cannot get off from washing will be picked up in the sticky paraffin. As it is cooling, the dirt and the foreign material on the hands will become embedded in the paraffin.

Mr. EISENBERG. So the paraffin acts as a base to pick up——

Mr. CUNNINGHAM. It acts as a medium in which the foreign material is picked up from the hands.

Mr. EISENBERG. When you add the reagent, what is considered to be a positive reaction?

Mr. CUNNINGHAM. It turns a blue color.

Mr. EISENBERG. That is the cast? When you say "it," it is the cast?

Mr. CUNNINGHAM. Well, specks on the cast.

Mr. EISENBERG. Dots?

Mr. CUNNINGHAM. Yes, or an area of the cast. The theory of the test is that it is a test for gunpowder residues. Now, that is the theory, and it is fallacious, inasmuch as the reagents used in these two tests are not specific for gunpowder residues. Now, it is true that the nitrates and nitrites in gunpowder residues will react positively with diphenylamine and diphenylbenzidine, but they are not specific. They will react—these two reagents will react with most oxidizing agents.

Mr. EISENBERG. Can you give us a few examples?

Mr. CUNNINGHAM. Yes. Urine, tobacco, cosmetics, pharmaceuticals, soil, fertilizer—I have a list here of the different families or classes of compounds that will react.

In addition to nitrates and nitrites, substances such as dichromates, permanganates, hypochlorites, periodates, some oxides, such as selenium dioxide and so forth. Also, ferric chloride and chromates and chlorates. The list of

oxidizing agents is so large—that will react—that you cannot specifically say it was a gunpowder residue.

Mr. CUNNINGHAM. Supposedly it is to determine whether or not a person has fired a weapon. In actuality, in chemistry it is a good indication that an oxidizing agent is present. The reagents have a valid use in a chemistry laboratory.

Representative BOGGS. Let me put the question this way. Given a dozen ordinary people in the ordinary walk of life, what would be the chance of a positive reaction on any one of these 12 people?

Mr. CUNNINGHAM. Excellent, sir.

Mr. EISENBERG. Has the FBI performed an experiment to determine this?

Mr. CUNNINGHAM. Yes; we have. The early sets of tests we ran with diphenylamine. And 17 men were involved in this test. Each man fired five shots from a .38 caliber revolver. Both the firing hand and the hand that was not involved in the firing were treated with parffin casts, and then those casts treated with diphenylamine. A total of eight men showed negative or essentially negative results on both hands. A total of three men showed positive results on the idle hand, but negative on the firing hand. Two men showed positive results on their firing hand and negative results on their idle hands. And four men showed positive on both hands, after having fired only with their right hands. That was the first test we ran.

The second test—we used people who had not washed their hands in any way. They were going about their duties during the day. Their hands were soiled. Nine people fired weapons out of 29—20 people just had the casts made.

The first person fired a revolver. Both right hand and left hand were positive. The second person fired a revolver. Both hands positive. A person fired an automatic pistol, where you would not expect to find residue. Both hands positive. Shooting with the right hand only, again one with a revolver and three people firing automatics, all positive. Shooting with the left hand only, one person with a revolver, one with an automatic, both hands positive.

Now, of the 20 people that had not come in contact with a gun—they definitely had just gone about their business—every one of them showed positive tests on either or both hands. A heavy smoker, for instance, would come up positive in the area of the hand where you expect to find residues from firing a gun.

Representative FORD. That is the hand that you use for smoking?

Mr. CUNNINGHAM. That's correct. And I noticed you with your pipe. You are also sure to react because you touch the tobacco in your pipe. You do it unconsciously. During another test we performed recently I did not know that the diphenylbenzidine was on the corner of the cast I was trying to pick up to wash off. I just touched it, and both my fingers which had touched my cigar turned a blue color. That is how sensitive it is.

Now, of these 20 people—true there were some that had one hand that did not get a reaction, but they all got a reaction, one hand or another, or both.

Now, recently in connection with the assassination we made casts—the three of us, Special Agents Frazier, Killion, and myself, for neutron-activation. However, two of the casts we treated with diphenylbenzidine. We obtained a cast of the left hand after firing this particular revolver four times and reloading. We obtained a cast of the right hand after firing that revolver four times, and reloading. We treated both casts, fronts and backs with diphenylbenzidine. This particular one was run on me. I washed my hands thoroughly with green soap—and the green soap, by the way, did not react because we checked it—the gauze used and the paraffin were all checked, to see if they would react, and they did not. We found numerous, numerous reactions on the casts of both hand. And I did not fire a weapon with my left hand. However, as I previously showed you, when I demonstrated how you ejected cartridge cases, all of those residues showed up, as well as, I am sure, other foreign material that the paraffin removed from my hands. And there were reactions on both hands, fronts and backs.

Now, theoretically, you should not find them on the backs over here, because I had my left hand behind me, and you would find it on the palm. We found reactions everywhere on the casts.

Representative FORD. It is 12:30 now. We will recess until 2 o'clock this afternoon.

(Whereupon, at 12:30 p.m., the President's Commission recessed.)

Afternoon Session

TESTIMONY OF CORTLANDT CUNNINGHAM RESUMED

The President's Commission reconvened at 2 p.m.

Mr. DULLES. You are still under oath, Mr. Cunningham, so we won't swear you again. Will you proceed?

Mr. EISENBERG. Mr. Cunningham, I would like to take up a few things relating to this morning's testimony and then we will go back to paraffin test.

First, I hand you two bullets and I ask you whether you are familiar with these bullets?

Mr. CUNNINGHAM. I am.

Mr. EISENBERG. Is your mark on those bullets?

Mr. CUNNINGHAM. On the nose; yes.

Mr. EISENBERG. Can you identify them to us?

Mr. CUNNINGHAM. These are two of the tests that I fired from Commission Exhibit 143, Oswald's revolver.

Mr. EISENBERG. One is a——

Mr. CUNNINGHAM. One of them is a copper-coated lead bullet. In this case, I know that it is Western, because that was the cartridge I used, and the other one is a Winchester .38 Special lead bullet.

Mr. EISENBERG. Mr. Chairman, may I have these admitted in evidence as Commission Exhibit 606?

Mr. DULLES. They may be admitted as 606.

(The bullets referred to were marked Commission Exhibit No. 606, and received in evidence.)

Mr. EISENBERG. Now, using these bullets as demonstrations, could you tell us how you determined that the bullets that were recovered from the body of Officer Tippit, which you looked at this morning, and those were Exhibits 602 through 604, were respectively a Western-Winchester .38 Special and a Remington-Peters .38 Special?

Mr. CUNNINGHAM. Yes, sir; however, I couldn't do it with these two bullets.

Mr. EISENBERG. Sure, use 602 to——

Mr. CUNNINGHAM. The copper-coated lead bullet. I could use and I did use it—I made a photograph.

Mr. EISENBERG. Before we discuss that further, let's see if we can mark that for identification. Can you describe what is in this photograph?

Mr. CUNNINGHAM. Yes. It is a photograph of four bullets. The first bullet starting from the left is Commission Exhibit No. 604. As you can see right on the label, it is Q–501, which would be Commission Exhibit 604. The next bullet to it is a test bullet that I fired from Commission Exhibit 143, which is a known 158-grain lead bullet of Remington-Peters manufacture.

The third bullet in the photograph is our number C–253, which is Commission Exhibit No. 603. And the fourth bullet in the photograph is this particular bullet which you have given Commission Exhibit 606. It is a copper-coated lead bullet of Western manufacture.

Mr. EISENBERG. Did you take this photograph?

Mr. CUNNINGHAM. I was present when it was taken. I compared the bullets with the negative, and I can testify that this photograph is a true representation—an accurate representation of the four bullets that were photographed.

Mr. DULLES. And this photograph is Commission Exhibit No.——

Mr. EISENBERG. If you will admit it into evidence, it will be 607.

Mr. DULLES. It may be admitted.

(The photograph referred to was marked Commission Exhibit No. 607 and was received in evidence.)

(At this point Representative Ford entered the hearing room.)

Mr. DULLES. All right.

Mr. EISENBERG. Mr. Cunningham, we have introduced a photograph, which is Commission Exhibit No. 607, which shows four bullets labeled "C–252," "R–P," "C–253," and "Western."

Are two of those bullets the bullets which you just identified as Exhibit 606?

Mr. CUNNINGHAM. No; Commission Exhibit 606, the copper-coated Western bullet, is the same bullet that was in this photograph, labeled the Western bullet.

Mr. EISENBERG. Could you hold that up?

Mr. CUNNINGHAM. Yes, sir; that is the bullet.

Mr. EISENBERG. The copper-coated or copper-colored bullet in 606 corresponds with the far right-hand side bullet labeled "Western" in 607?

Mr. CUNNINGHAM. That is right.

Mr. EISENBERG. What about the lead-colored bullet in 606?

Mr. CUNNINGHAM. That is a Remington-Peters 158-grain lead bullet. I do not have that one with me.

Mr. EISENBERG. This would be similar in appearance though to the bullet which was photographed as the "R–P" bullet?

Mr. CUNNINGHAM. No, it isn't.

Mr. EISENBERG. Why is that?

Mr. CUNNINGHAM. Because this is a Winchester.

Mr. EISENBERG. Why isn't it copper coated?

Mr. CUNNINGHAM. The Western Cartridge Division of Olin Mathieson Corp. loads both lead- and copper-coated bullets into their .38 Specials.

As of today, Winchester is only loading—under that brand—uncoated bullets. That is what their latest catalog says.

Only Western is loading copper-coated bullets. They are both made in the same factory—they are both made by the Western Cartridge Division of Olin Mathieson Chemical Corp. in East Alton, Ill.

Mr. EISENBERG. So you didn't give us an R–P test bullet?

Mr. CUNNINGHAM. I did not.

Mr. EISENBERG. I see. Did you use an R–P test bullet in attempting to make your identification?

Mr. CUNNINGHAM. Yes; you asked for our first two tests.

Mr. EISENBERG. I see. Okay. Can you show by use of that photograph, Exhibit 607, how you were able to determine that certain of the bullets found in Officer Tippit were of R–P manufacture, .38 Special, and certain were Winchester-Western?

Mr. CUNNINGHAM. Yes.

First of all, in the manufacture of these bullets, each manufacturer has his own specifications for how they are to look. By that I mean generally that both manufacturers' bullets are similar. They are similar in weight. They are generally similar in size and diameter as well as length. However, the number and the spacing between the grooves—these grooves, the cannelures, are not similar. It is actually a knurling process, you can see the knurling marks.

Mr. DULLES. What is the purpose of those?

Mr. CUNNINGHAM. Lubrication grooves. .38 Specials being lead bullets—in order to keep down excessive leading they put in a lubricant—Remington-Peters—they use a very dark heavy lubricant. Western-Winchester, they use a very light-colored waxy type of lubricant.

Mr. DULLES. Thank you.

Mr. CUNNINGHAM. Up above you will see a small groove. It is nothing more than just a slight groove. That can be caused when the case is crimped, the bullet is crimped into the case.

Representative FORD. That is in the R–P?

Mr. CUNNINGHAM. On both of them, sir.

Representative FORD. That is on both?

Mr. CUNNINGHAM. Yes; you see one here, that has actually been put in. They

load up to that certain place and they crimp into that groove, which is known as a crimping groove.

Mr. EISENBERG. When you say crimping groove, do you mean the cartridge is tightened around the case?

Mr. CUNNINGHAM. The neck of the case is tightened around—is crimped into the bullet. The distance between the base to the first cannelure, and the width of the cannelure, the portion of the bullet between the two cannelures, and the width of the next cannelure, is individual with Remington-Peters bullets.

In other words, Western-Winchester bullets are not made with the same width cannelures and the same distances between the two of them. Each manufacturer prefers to have a certain distance between cannelures and a certain width of cannelure, and it is strictly individual to each company. By these specifications—and also another very important thing is the base shape—you can determine whether or not a bullet is of one manufacture or another.

If you will take these two, one of the tests in Commission Exhibit No. 606, you will see that the number, the width and everything about the copper-coated Western and the uncoated Winchester are the same. In other words, they put a flash coat of the gilding metal on the bullet and as I testified previously its chief value is for sales appeal, and, a secondary value to prevent leading.

(Discussion off the record.)

Mr. DULLES. Back on the record again. Continue please.

Mr. EISENBERG. Mr. Cunningham, as of November 22, 1963, how many major manufacturers were there in the United States who were manufacturing .38 Special bullets?

Mr. CUNNINGHAM. Three.

Mr. EISENBERG. Who were they?

Mr. CUNNINGHAM. First, is the Western Cartridge Division of Olin Mathieson Chemical Corp., East Alton, Ill., which manufactures ammunition under the trade names "Western" as well as "Winchester."

The next major manufacturer is Du Pont, and they manufacture in their Remington Cartridge Division ammunition under the trade names "Remington" and "Peters," and the third manufacturer is Federal Cartridge Co. in Minneapolis.

Mr. EISENBERG. How many manufacturers of .38 Special ammunition are there outside the United States, approximately?

Mr. CUNNINGHAM. I would have no way of knowing all of them. I know it is manufactured in Canada by Dominion, and Norma also manufactures it.

Mr. DULLES. What was that name?

Mr. CUNNINGHAM. Norma.

Mr. DULLES. N-o-r-m-a?

Mr. CUNNINGHAM. Yes, sir.

Representative FORD. In Canada too?

Mr. CUNNINGHAM. No, sir; it is in Sweden.

DWM in Germany must manufacture it, I am just recalling these larger manufacturers that should manufacture it. Also, some English manufacturers.

Mr. EISENBERG. How are you certain that one of the bullets found in Officer Tippit was not manufactured by one of the foreign manufacturers, either one you are acquainted with or one you are not?

Mr. CUNNINGHAM. We maintain a Test Specimen and a Standard Ammunition File, and we have foreign ammunition in them, although I don't think we have all of the foreign. But we have never come across a foreign-made bullet with the same physical characteristics as the bullets represented by those removed from the body of Office Tippit.

Mr. EISENBERG. Do you attempt to get a complete file of .38 Special ammunition?

Mr. CUNNINGHAM. We definitely maintain an up-to-date file in our Standard Ammunition File in the laboratory of all domestic manufactured ammunition as well as some foreign, for instance, Norma and Dominion, and we have specimens from other foreign manufacturers.

Mr. EISENBERG. And you say that of the specimens you do have which you feel are as complete as possible you have never come across two types which are similar at least to these .38 Specials?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. Now Mr. Frazier yesterday said that the Walker bullet seemed to be a 6.5 millimeter bullet or may have been fired from the 6.5 millimeter Mannlicher-Carcano rifle, had the same general rifling characteristics as was found on that rifle which is in evidence as Commission Exhibit——

Mr. CUNNINGHAM. 139.

Mr. EISENBERG. Yes; 139.

Now do you have a complete file of 6.5 or a large file of 6.5 millimeter ammunition?

Mr. CUNNINGHAM. We have some.

Mr. EISENBERG. Do you feel it is as complete as your .38 Special file?

Mr. CUNNINGHAM. No; I do not. However, we have never found any foreign manufacturer manufacturing 6.5 Mannlicher-Carcano ammuntion that was similar to this.

From its general appearance, it has all the similarities of a western-world-manufactured bullet——

Mr. EISENBERG. Now this is Commission——

Mr. CUNNINGHAM. In other words, the knurling is typical—the physical characteristics were similar to those of the bullets manufactured by the Western Cartridge Co.

Mr. EISENBERG. This is Commission Exhibit 573, which is the—as to which Mr. Frazier has testified, and which is believed to be the bullet found in the Walker residence.

Are you familiar with it?

Mr. CUNNINGHAM. Yes, sir.

Mr. EISENBERG. And you have examined it as well as Mr. Frazier?

Mr. CUNNINGHAM. I have.

Mr. EISENBERG. Would you say that this bullet was a 6.5-mm. Western copper-jacketed Mannlicher-Carcano bullet?

Mr. CUNNINGHAM. I would.

Mr. EISENBERG. As definitely as you say the bullets which we have just been looking at are respectively Remington-Peters and Western-Winchester .38 Special bullets?

Mr. CUNNINGHAM. Yes, sir.

Mr. DULLES. Could I see that just a moment?

What did that hit, the brick wall of the house?

Mr. CUNNINGHAM. I have no idea, sir.

Mr. DULLES. You don't know?

Mr. CUNNINGHAM. I don't know. I have no first-hand knowledge of it. It is in essentially the same condition as when we received it in the laboratory, and all I know would be what has already been furnished your Commission by report.

Mr. DULLES. Thank you.

Mr. EISENBERG. Now given the fact that that was a 6.5-millimeter Mannlicher-Carcano cartridge, could that have been fired in any other 6.5-millimeter rifle?

Mr. CUNNINGHAM. No, sir; it has to be a rifle that is chambered specifically for this particular cartridge. In other words, there are other 6.5-millimeter cartridges.

Mr. EISENBERG. Now, as I understand it, your conclusion and Mr. Frazier's was only that this cartridge, that this bullet, could have been fired from Exhibit 139 or a rifle with similar——

Mr. CUNNINGHAM. On the basis of the rifling characteristics it could have been fired from 139. However, there are insufficient marks remaining to determine whether or not it had actually been so fired.

Mr. EISENBERG. Now the testimony yesterday as I recall it was that it was fired either from Exhibit 139 or from a rifle with similar, or from a weapon with similar rifling characteristics?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. But according to your testimony it would have to be similar to a 6.5-millimeter Mannlicher-Carcano rifle?

Mr. CUNNINGHAM. No; I did not so testify. You asked if you could fire another 6.5-mm. cartridge other than the cartridge——

Mr. EISENBERG. I asked if that cartridge, if a Western manufacture 6.5-mm. Mannlicher-Carcano cartridge could be fired in a gun other than the 6.5-mm. Mannlicher-Carcano. And you said, as I recall it, "It could only be fired from a gun chambered for that cartridge."

Mr. CUNNINGHAM. That is correct. That 6.5-mm. Mannlicher-Carcano cartridge could only be fired in a weapon that is chambered for that particular cartridge. Further we have never found another cartridge that this particular type bullet has been loaded into.

Mr. EISENBERG. Have you any reason to believe there is another 6.5-millimeter rifle manufactured that is chambered for that cartridge?

Mr. CUNNINGHAM. None that I know of. Maybe I misunderstood you. You mean, if the weapon is chambered for a 6.5-millimeter Mannlicher-Carcano, then that is commonly known as its caliber?

Mr. EISENBERG. Yes.

Mr. CUNNINGHAM. But you can rechamber weapons for another cartridge, as they do all the time with the military surplus Springfield rifles. You can have them rebarreled and rechambered.

Mr. EISENBERG. Apart from rechambering, talking just about original manufacture, do I understand that the only weapon which you have encountered, the only 6.5 millimeter weapon you have encountered which would fire the particular type of cartridge which is Exhibit 573 is the Mannlicher-Carcano rifle?

Mr. CUNNINGHAM. Yes, sir; the various models of it.

Mr. EISENBERG. Okay.

Before the luncheon—are there any further questions along this line?

Before the luncheon recess we were talking about the paraffin test and we were discussing the significance of a positive result, and you had given testimony concerning two experiments which the FBI had run which indicated that positive results might be obtained even by a person who had not recently fired a weapon?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. A paraffin test was also run of Oswald's cheek and it produced a negative result.

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. Do your tests, or do the tests which you ran, or your experience with revolvers and rifles, cast any light on the significance of a negative result being obtained on the right cheek?

Mr. CUNNINGHAM. No, sir; I personally wouldn't expect to find any residues on a person's right cheek after firing a rifle due to the fact that by the very principles and the manufacture and the action, the cartridge itself is sealed into the chamber by the bolt being closed behind it, and upon firing the case, the cartridge case expands into the chamber filling it up and sealing it off from the gases, so none will come back in your face, and so by its very nature, I would not expect to find residue on the right cheek of a shooter.

Mr. EISENBERG. Would you expect to find residues on a person who has fired a revolver such as Commission Exhibit 143?

Mr. CUNNINGHAM. There again, by its design, you would expect to find something, although there are cases where you won't find it.

Mr. EISENBERG. Why do you expect to find a residue in the case of the revolver as opposed to the rifle?

Mr. CUNNINGHAM. A revolver has a revolving cylinder. There is a space between the barrel and the front portion of the cylinder.

Mr. EISENBERG. I wonder whether you could show that by use of Exhibit 143?

Mr. CUNNINGHAM. You can see when you close the cylinder, and each chamber lines up, there is a few thousandths space between. When the bullet is fired, the bullet jumps across this space and enters the ramp and then into the rifling.

The gases always escape through this small space. The loss is negligible, but the gases are escaping on every shot. After you fire this revolver, you can see residues, smoke deposits and other residues around the entrance to the rear

portion of the barrel which is next to the cylinder, as well as on the cylinder itself.

So you would expect to find gunpowder residues on a person's hands after he fired a revolver.

Mr. EISENBERG. Do I understand your testimony to be that there is no equivalent gap in the manufacture of a rifle?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. Did you run any kind of a test with this revolver which would indicate whether it did in fact leave residues?

Mr. CUNNINGHAM. Yes; I did, or we did, three of us, Mr. Frazier, Mr. Killion, and myself. The tests were run on me. I was the one who washed my hands thoroughly. I did not use a brush, I just washed them with green soap and rinsed them in distilled water.

Mr. EISENBERG. The purpose of this washing was what?

Mr. CUNNINGHAM. To remove possible dirt from my hands. I washed my hands. The gun was then wiped off with dilute HCl to get rid of any deposits already on the gun, and I fired it in our bullet-recovery room, four times—and then after firing I opened it up and ejected the cartridge cases into my hand, as I showed you earlier today. The amount of residue that you pick up on your hands from ejection of the cartridge cases was in my hand at the time.

I then, under ideal conditions naturally, went back and had paraffin casts made of my hands and these were treated with a solution of diphenylbenzidine.

The results of this examination were that we got a positive result on both casts, front and back. Many reactions in this area where I had ejected the cartridge cases in my hand were noted.

Mr. EISENBERG. By the way, you testified this morning that many common substances will produce a positive reaction to the nitrate test, so-called paraffin test.

Will the handling of an unclean weapon also produce a positive reaction?

Mr. CUNNINGHAM. Just as much as firing it will. That is what makes this test so unreliable. Handling a recently fired weapon, that is covered with residues—you would get just as many oxidizing agents in the form of nitrates and nitrites on your hands as you would from firing it and in some cases more—especially up here and around here you would.

Mr. DULLES. Does the time between the tests, between the firing and the test, make very much difference, within a few hours?

Mr. CUNNINGHAM. If the residues are on the skin they will react. In other words, if the material has been washed off completely, then you are all through, but if it remains on the skin or is imbedded in the pores of the skin it would still react, but so will so many other things.

Mr. EISENBERG. Just to review for a second your testimony this morning, in the experiments that the FBI ran, a revolver or automatic pistol were used as opposed to rifles, as I recall it?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. Were there any negative results following the shooting of the revolver or automatic pistol?

Mr. CUNNINGHAM. None of those were negative results, but they were not run under the same conditions. By the way, with an automatic pistol you shouldn't expect to find any residues, for the same reason as with a rifle—the cartridge is chamber, and the boltface comes in right behind.

Mr. EISENBERG. Could you look at your notes for your first experiment, because as I recall there were some negative results on that.

Mr. CUNNINGHAM. The only negative results were on the 20 people who were run as a control and who had never fired a gun, and even for those people they all got positive reactions at least on one hand.

Mr. EISENBERG. I am talking about the first experiment now, not the second one.

Mr. CUNNINGHAM. The first experiment—yes; that was true. This test was a little bit different.

In other words, they were not just taking people from their work. These people had washed their hands.

Mr. EISENBERG. In other words, their hands were cleaned before they fired the weapon?

Mr. CUNNINGHAM. Yes.

Mr. EISENBERG. But then some of them fired a revolver and still didn't get a residue, as I remember your testimony?

Mr. CUNNINGHAM. That is correct.

Mr. EISENBERG. Did you make a test with the exhibit, with the rifle, 139, to determine whether that left a powder residue on the right cheek?

Mr. CUNNINGHAM. We did.

Mr. EISENBERG. Will you describe that test?

Mr. CUNNINGHAM. Yes; this time we ran a control. We were interested in running a control to find out just what the possibility was of getting a positive reaction after a person has thoroughly washed their hands. Mr. Killion used green soap and washed his hands, and we ran a control, both of the right cheek and of both hands.

We got many reactions on both the right hand and the left hand, and he had not fired a gun that day.

Mr. EISENBERG. This was before firing the rifle?

Mr. CUNNINGHAM. Yes, sir. That was before firing the rifle. We got no reaction on the cheek.

Mr. EISENBERG. Also before firing the rifle?

Mr. CUNNINGHAM. Yes.

We fired the rifle. Mr. Killion fired it three times rapidly, using similar ammunition to that used in the assassination. We reran the tests both on the cheek and both hands. This time we got a negative reaction on all casts.

Mr. EISENBERG. So to recapitulate, after firing the rifle rapid-fire no residues of any nitrate were picked off Mr. Killion's cheek?

Mr. CUNNINGHAM. That is correct, and there were none on the hands. We cleaned off the rifle again with dilute HCl. I loaded it for him. He held it in one of the cleaned areas and I pushed the clip in so he would not have to get his hands near the chamber—in other words, so he wouldn't pick up residues, from it, or from the action, or from the receiver. When we ran the casts, we got no reaction on either hand or on his cheek. On the controls, when he hadn't fired a gun all day, we got numerous reactions.

Mr. EISENBERG. Are there any further questions on the paraffin test?

Representative FORD. Based on your testimony this morning, and what you have told us in the last few minutes, why are paraffin tests conducted and how extensively are they?

Mr. CUNNINGHAM. Many local law-enforcement agencies do conduct these tests, and at their request the FBI will process them. They take the cast and we will process them.

However, in reporting, we give them qualified results, since we frequently will get some reaction. Numerous reactions or a few reactions will be found on the casts. However, in no way does this indicate that a person has recently fired a weapon. Then we list a few of the oxidizing agents, the common ones, such as in urine and tobacco and cosmetics and a few other things that one may come in contact with. Even Clorox would give you a positive reaction.

Representative FORD. Is this a test that has been conducted by law-enforcement agencies for some time. Is it a new test?

Mr. CUNNINGHAM. No, sir; the first test that I reported on here were conducted in 1935.

There may be some law-enforcement agencies which use the test for psychological reasons.

Mr. DULLES. Explain that.

Mr. CUNNINGHAM. Yes, sir; what they do is they ask, say, "We are going to run a paraffin test on you, you might as well confess now," and they will—it is—

Mr. DULLES. I get your point.

Mr. EISENBERG. Following up Congressman Ford's question, does the FBI run paraffin tests except on request from other law-enforcement agencies?

Mr. CUNNINGHAM. We don't, no. Basically, the paraffin test is the preparing of the cast. We don't do that. We will run the chemical processing of these casts at the request of the local law-enforcement agency.

Mr. EISENBERG. To rephrase it, if the FBI is having an investigation by itself in a matter it has primary jurisdiction over, will it use the paraffin test?

Mr. CUNNINGHAM. No; not the paraffin-chemical test.

Representative FORD. Is that because of the feeling that it is not as reliable as it should be?

Mr. CUNNINGHAM. It is the feeling that it is definitely not reliable as to determining whether or not a person has fired a weapon. It is positive, and diphenlybenzidine solution is very positive and very sensitive, as to whether or not an oxidizing agent is present and it is used in chemistry.

Mr. DULLES. You and I with our pipes would be in trouble here, wouldn't we?

Mr. CUNNINGHAM. Yes, sir; I mentioned that this morning.

Representative FORD. He brought it out this morning.

Mr. CUNNINGHAM. I would be willing to state right now if we processed both of your hands you would come up positive, because invariably pipe smokers stick their finger in the bowl and you would get a positive reaction.

I am a cigar smoker, I also would come up positive.

Mr. EISENBERG. I don't have any further questions, Mr. Chairman.

Mr. DULLES. Do you have any further questions?

Representative FORD. I have no questions.

Mr. RHYNE. I take it in sum and substance that these paraffin tests are practically worthless?

Mr. CUNNINGHAM. For the determination of whether or not a person has fired a weapon.

Mr. RHYNE. A gun?

Mr. CUNNINGHAM. Yes.

Now the test is not worthless in chemistry.

Mr. DULLES. What use are they then except possibly from this psychological angle that you have mentioned?

Mr. CUNNINGHAM. We don't——

Mr. DULLES. Are they useful in other ways than but for the psychological reasons you mentioned?

Mr. CUNNINGHAM. As far as whether or not a person has fired a gun?

Mr. DULLES. Yes.

Mr. CUNNINGHAM. No. Even with the mere handling of this weapon I could pick up residues. One could not testify that a person has fired a weapon because he had residues on his hands, which I showed you this morning, for example. There is a spot right there on my hand, and all I have done is empty the weapon.

Representative FORD. Did the FBI conduct a paraffin test on Oswald?

Mr. CUNNINGHAM. No, sir; the Dallas Police Department did.

Representative FORD. The FBI did not?

Mr. CUNNINGHAM. We did not, sir.

Representative FORD. You didn't analyze it?

Mr. CUNNINGHAM. We did not. We obtained the paraffin casts and another agent in the spectographic unit took them to Oak Ridge and had them subjected to neutron activation, with which I am not familiar. But we did not do the original examination and the reporting. I don't know definitely as to what the Dallas Police Department did.

Mr. EISENBERG. It was under the supervision of the Dallas Police Department. I think a doctor performed the test, I am not sure whether it was a police doctor or not.

By the way, after the paraffin test is run, does the positive reaction stay evident on the paraffin cast?

Mr. CUNNINGHAM. No, it does not, due to the fact you have to wash it off. The solution of diphenylbenzidine is 70 percent sulphuric acid. The solution we were using in these tests was .25 grams of diphenylbenzidine to 100 ml. of 70 percent sulphuric acid, and sulphuric acid is corrosive. In other words, the majority of the solution is 70 percent sulphuric acid.

Mr. EISENBERG. So the casts as they are now don't show anything except white paraffin?

Mr. CUNNINGHAM. That is correct.

Mr. DULLES You have no further questions?

Mr. MURRAY. No, thank you, sir.

Mr. DULLES. Thank you very much, Mr. Cunningham. Thank you very much, sir.

TESTIMONY OF JOSEPH D. NICOL

Mr. DULLES. Mr. Nicol, I am presiding at the request of the Chief Justice.

Will you kindly raise your right hand. Do you swear the testimony you will give before this Commission is the truth, the whole truth, and nothing but the truth, so help you God?

Mr. NICOL. I do.

Mr. EISENBERG. Mr. Nicol, would you state your name and position?

Mr. NICOL. Joseph D. Nicol, Superintendent of the Bureau of Criminal Identification and Investigation for the State of Illinois.

Mr. EISENBERG. Could you briefly describe your qualifications in the field of firearms investigation?

Mr. NICOL. I began studying this field in 1941 in the Chicago Police Crime Laboratory under Charles Wilson, remained there as a firearms technician for approximately 9 years, and then moved to Pittsburgh, where I directed and set up the Pittsburgh and Allegheny County Crime Laboratory, also working in the field of ballistics.

Then I went to Miami, Fla., and set up the Dade County Crime Laboratory and worked there for 5 years. I went to Michigan State and taught for 4 and now I am back in Illinois, in Springfield, as Superintendent of the Bureau.

Mr. EISENBERG. Could you tell us approximately how many bullets and cartridge cases you have examined to identify them or attempt to identify them to suspect weapons?

Mr. NICOL. This would number in the thousands, I do not have an exact figure, but our caseload in Chicago is approximately 4,000 guns annually, of which we would make approximately between 10 and a dozen comparisons, so the comparisons that would be conducted by myself or those under my direct supervision would be approximately 50,000 a year. Now this is just a rough figure.

Mr. EISENBERG. Do you have any publications or lectures?

Mr. NICOL. I have one minor publication in the field of firearms. Most of my publication work has been with the "Journal of Criminology" in the area of the technical note and abstract section.

I do not have any major publications in the firearms field.

Mr. EISENBERG. What is your association with that Journal?

Mr. NICOL. I am associate editor of the "Journal of Criminal Law and Criminology."

Mr. EISENBERG. Do you lecture on any regular basis?

Mr. NICOL. At the present time I am lecturing with the University of Illinois in criminal investigation, at the Chicago campus, and prior to that I had been on the staff at Michigan State University for approximately 4 years.

Mr. EISENBERG. What was your education before you went into this field?

Mr. NICOL. I have a Bachelor of Science degree in Chemistry from Northwestern, and during the period that I was with the Chicago Crime Laboratory I got a Master's in Physics also from Northwestern.

Mr. EISENBERG. Mr. Chairman, I would like permission to take Mr. Nicol's testimony as an expert witness in the field of firearms identification.

Mr. DULLES. You may proceed.

Mr. EISENBERG. Now, Mr. Nicol, I will hand you 3 exhibits, 3 items, Commission Exhibits 399, 567, and 569, which I will describe for the record as being a bullet and 2 bullet fragments, and I ask you whether you are familiar with those 3 Commission Exhibits?

Mr. NICOL. May I examine them?