IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLORADO
Criminal Action No. 96-CR-68
UNITED STATES OF AMERICA,
Plaintiff,
vs.
TERRY LYNN NICHOLS,
Defendant.
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REPORTER'S TRANSCRIPT
(Trial to Jury: Volume 64)
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Proceedings before the HONORABLE RICHARD P. MATSCH, Judge, United States District Court for the District of Colorado, commencing at 1:35 p.m., on the 5th day of November, 1997, in Courtroom C-204, United States Courthouse, Denver, Colorado.

Proceeding Recorded by Mechanical Stenography, Transcription Produced via Computer by Paul Zuckerman, 1929 Stout Street, P.O. Box 3563, Denver, Colorado, 80294, (303) 629-9285

APPEARANCES

PATRICK RYAN, United States Attorney for the Western District of Oklahoma, 210 West Park Avenue, Suite 400, Oklahoma City, Oklahoma, 73102, appearing for the plaintiff.

LARRY MACKEY, SEAN CONNELLY, BETH WILKINSON, GEOFFREY MEARNS, JAMIE ORENSTEIN, and AITAN GOELMAN, Special Attorneys to the U.S. Attorney General, 1961 Stout Street, Suite 1200, Denver, Colorado, 80294, appearing for the plaintiff.

MICHAEL TIGAR, RONALD WOODS, ADAM THURSCHWELL, and JANE TIGAR, Attorneys at Law, 1120 Lincoln Street, Suite 1308, Denver, Colorado, 80203, appearing for Defendant Nichols.

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PROCEEDINGS

(Reconvened at 1:35 p.m.)

THE COURT: Be seated, please.

Yes, Miss Wilkinson.

MS. WILKINSON: Your Honor, as to the exhibit, Government Exhibit 1702B, I showed it to Mr. Tigar, and he agreed -- we had the agent circle the portion and initial it.

THE COURT: You mean physically on that.

MS. WILKINSON: Yes, instead of the computer printout -- we fixed the problem -- and he's agreed this would be admissible.

MR. TIGAR: We agreed subject to all of the other things we talked about it, it would be admissible.

MS. WILKINSON: Excuse me, your Honor.

THE COURT: What is the designation?

MS. WILKINSON: The number?
THE COURT: Yes.
MS. WILKINSON: 1702B.
THE COURT: Thank you.
(Jury in at 1:35 p.m.)
THE COURT: Members of the jury, we do have now 1702B which is a little photograph of this one that you will recall, 1702, that was marked by the testifying agent didn't come out right on the machine, so we got the picture, and he just marked it physically, and we've taken it into evidence.
I mention a Polaroid, I oughtn't to be using a trade name like that. I guess Kodak and some other Instamatics. But you know what I mean.
Our next witness, please.
MR. MACKEY: As our next witness, we would call Mr. Paul Rydlund.
THE COURT: All right.
THE COURTROOM DEPUTY: Would you raise your right hand, please.
(Paul Rydlund affirmed.)
THE COURTROOM DEPUTY: Would you have a seat, please.
Would you state your full name for the record and spell your last name.
THE WITNESS: Paul Harris Rydlund, R-Y-D-L-U-N-D.
THE COURTROOM DEPUTY: Thank you.
THE COURT: Miss Wilkinson.
MS. WILKINSON: Thank you, your Honor.

DIRECT EXAMINATION

BY MS. WILKINSON:
Q. Good afternoon, Mr. Rydlund.
A. Good afternoon.
Q. Could you tell the jury where you live.
A. St. Louis, Missouri.
Q. How old are you?
A. 59 years old.
Q. And what is your profession?
A. I'm a mining engineer.
Q. What has been the focus of your professional employment over the past years?
A. I have been involved in the development and the uses of ammonium nitrate in the commercial explosives industry.
Q. How long have you been doing that?
A. I've been doing that for 34 years.
Q. Where do you currently work?
A. I currently work for El Dorado Chemical Company in St. Louis, Missouri.
Q. How long have you worked for them?
A. I've worked for them 13 years.

Q. Can you tell us what El Dorado Chemical Company sells.
A. El Dorado Chemical Company is involved in both industrial and agricultural businesses. In the industrial business, they sell industrial acids such as sulfuric acid, weak nitric acid, strong nitric acid. In the industrial business as well, we

strong nitric acid. In the industrial business as well, we sell industrial ammonium nitrate to the explosive industry, and we also sell a number of explosive products directly to the mining industry as well.
Q. What type of explosive products do you sell to the mining industry?
A. We sell blasting agents such as ANFO. We sell high explosives such as dynamite, water gels, high-explosive emulsions. We sell detonators such as electric blasting caps, non-electric blasting caps.
Q. Now, could you briefly tell us about your educational background. Where did you attend university?
A. I attended the University of Missouri at Rolla, and I have a bachelor of science and a master of science in mining engineering.
Q. When did you obtain those degrees?
A. In 1963 and 1965.
Q. When you were in school, did you concentrate on explosives at any time?
A. Yes, I did.
Q. What did you do?

A. In my graduate work, I worked on the development of ammonium nitrate for commercial explosives. This was done under a project that was funded by Monsanto Company. And so I was a graduate assistant and worked on that project.
Q. You said Monsanto funded that project?
A. Yes, they did.
Q. Where did you work after you left school?
A. After I left school, I went to work for Monsanto Company.
Q. Is that a coincidence --
A. No. I continued to work on that same project then.
Q. What did you do for them initially?
A. I spent five years in research in which we analyzed and evaluated the uses of ammonium nitrate in commercial explosives.
Q. And --
A. And then after that, I went into the operations and marketing of industrial explosives.
Q. During your time with the company and your subsequent experience, have you become familiar with the chemical properties and the explosive capabilities of ammonium nitrate?
A. Yes, I have.
Q. Now, tell us how long you were involved in operations.
A. I was involved in operations for a period of five to eight years.
Q. During that time did you become familiar with the

manufacturing process of ammonium nitrate?
A. Yes, I did.
Q. Did you also become familiar with the common practices

Q. Did you also become familiar with the common practices throughout your industry?
A. Yes, I did.
Q. After you finished working in operations, what did you do?
A. Then I became involved in marketing, field marketing of the products and field use of the products.
Q. And how long did you work for Monsanto?
A. I worked for Monsanto for 19 years.
Q. What happened to them at that point?
A. It -- after 19 years, Monsanto sold that business to a company in Oklahoma City called LSB Industries, and they formed El Dorado Chemical Company.
Q. And have you been employed by them ever since?
A. I've been employed by El Dorado Chemical Company ever since.
Q. What did you do for El Dorado when you first joined their company?
A. I was a director of industrial explosive group.
Q. What did you do in that capacity?
A. In that capacity I directed the marketing and the technical use of the products.
Q. How long did you do that?
A. I did that up until 1992 at which time I was named vice

president.
Q. And that's what you're doing today?
A. That's my current capacity.
Q. Could you tell us what your general duties are as vice president.
A. My general duties are again to direct both the marketing of our industrial acids and our industrial explosives group.
Q. During your 33 or 34 years in the commercial explosives business, have you become involved with any professional societies?
A. Yes, I have.
Q. Tell us about that.
A. I am a member of the Society -- I'm sorry, American Society of Mining Engineers and also the International Society of Explosives Engineers.
Q. How long have you been a member of those organizations?
A. Well, I've been a member of the Society of Mining Engineers for about 30 years, I believe. And on the International Society of Explosives Engineers for about 15 years.
Q. In your capacity as vice president, are you a member of any professional safety associations?
A. Yes. I am currently serving as the chairman of the board of governors for the Institute of Makers of Explosives, which is a safety organization for the explosive industry.
Q. That's who they represent?

A. Yes.

Q. And what are you doing in that position as the chairman?
A. As chairman of the board of governors, basically I preside over the decisions of the board. But basically our basic work there is to recommend or suggest regulations as to the safe handling, use, transportation, and manufacture of industrial explosives.
Q. So from that experience and from your other experience in your business, are you familiar with the safety standards for manufacturing, storing, handling, and using ammonium nitrate as well as other explosives materials?
A. Yes, I am.
Q. Now, during your career, can you tell the jury a little bit about the type of field experience you've had.
A. In the field -- the field experience I've had has been to design blasts, evaluate blasts which would go into how many pounds should we load into the blast hole, how should we initiate the blast hole, what type of high explosives should we use and what sequence should we use in shooting the individual blast holes to provide the best breakage in the mine.
Q. Does your experience in the field include the mixing of explosive products?
A. Yes, it does.
Q. Have you ever, yourself, mixed explosives?
A. Yes, I have.

Q. Do you know how many times?
A. Well over a hundred times.
Q. Have you ever observed the detonation of ammonium nitrate and fuel oil?
A. Yes, I have.
Q. Have you observed the detonation of ammonium nitrate and other types of fuels?
A. Yes, I have.
Q. Do you also review literature to keep current in your field?
A. I do.
Q. Tell us about that.
A. I review a number of periodicals, magazines as well, resulting in improvements in industrial explosive business. Recently authored a section on ammonium nitrate for the International Society of Explosives Engineers' handbook on blasting.
Q. In your career, have you had the opportunity to visit other manufacturing facilities of other chemical companies that compete in your market?
A. Yes, I have.
Q. Tell us which facilities you have visited.
A. I have visited the ammonium nitrate manufacturing facility of ICI in Joplin, Missouri. And I have visited the ammonium nitrate manufacturing facilities of DynoNobel in Louisiana,

Missouri, and Donora, Pennsylvania, and I have visited the explosive manufacturing facility of Austin Powder in McArthur, Ohio.
Q. Are those some of the major competitors of El Dorado?
A. They are major competitors, yes, they are.
Q. Let's talk a little bit about ammonium nitrate. Can you tell us what ammonium nitrate is.
A. Ammonium nitrate is a compound made out of ammonia and nitric acid.
Q. Can you tell us: Is all ammonium nitrate the same?
A. Chemically, yes. Physically, no.
Q. What do you mean by that?
A. In the solid form, ammonium nitrate comes in basically two forms: A very dense, a very dense particle size, and then it also comes in a more porous particle size.
Q. And are there terms, common terms, used to refer to those two types of ammonium nitrate?
A. Yes. The very dense or tightly packed product is called high-density ammonium nitrate, and the porous material is called low-density ammonium nitrate.
Q. And do you distribute those two different products to two different type of customers?
A. Yes, we do.
Q. Tell us about that.
A. The high-density ammonium nitrate is sold into the

agricultural industry.
Q. Why is that?
A. And because of the density of the product and the ability of the product to spread evenly with other ingredients, with other compounds used in the fertilizer industry such as potash and phosphates.
Q. You said you also -- you, your company manufactures low-density ammonium nitrate?
A. Yes, we do.
Q. Is that true? And you're familiar with that process?
A. Yes.
Q. And who is the typical customer for the low-density --
A. That is used in the explosive business.
Q. Are you aware of the practices in your industry about distributing low-density ammonium nitrate?
A. Yes.
Q. And has there -- are there costs that you incur in terms of distributing ammonium nitrate?
A. Well, yes. There's of course the manufacturing cost and then the transportation cost to take the ammonium nitrate to the market.
Q. Is that one of biggest costs you face?
A. Transportation is a very major cost in the distribution of ammonium nitrate.
Q. Based on that, is it a practice within your industry to

sometimes distribute low-density ammonium nitrate to the agricultural community?
A. Yes, it is. Because there are lower costs, there could be lower costs in doing so.
Q. Explain that, would you --
A. If the -- in a particular instance -- as an example, I would use Joplin, Missouri -- there is a very good agricultural market, particularly around Springfield, Missouri, that is close to Joplin, and the Joplin plant makes low-density ammonium nitrate, but they can cost that material into this agricultural market, they have a pretty good cost because there is very little transportation between the two locations. So there are opportune times when that practice is used.
Q. Could you tell us in what form ammonium nitrate is manufactured?
A. Ammonium nitrate is manufactured in a form that's called a prill. P-R-I-L-L.
Q. What's a prill?
A. A prill resembles a miniature snowball. It's a glomeration of ammonium nitrate crystals that are packed into just like a miniature snowball. A prill is about 1 millimeter, 125th of an inch in diameter. And it's spherical in shape.
Q. Can an ammonium nitrate prill or a group of prills be used as an explosive?
A. No. No. Not by themselves, they cannot be.

Q. And what do you need to make ammonium nitrate prills an explosive?
A. You would need a sensitizer or a fuel such as fuel oil or there are other fuels available that are used, nitromethane, for instance.
Q. Now, is there a term for ammonium nitrate -- if you're going to combine it to make it an explosive with fuel, is there some term that you use?
A. ANFO is a term that's used for when you combine ammonium nitrate with fuel oil.
Q. Is there a term for just the ammonium nitrate if you're going to combine fuel, which you call a sensitizer, I believe -- is there a term used to refer to the ammonium nitrate?
A. As a blasting agent when we call the two of them, yes.
Q. Are you familiar with the term "oxidizer"?
A. Yes.
Q. What is that?
A. An oxidizer is a material that when -- well, ammonium nitrate is an oxidizer, and an oxidizer is a material that when it undergoes decomposition, particularly if it was burning, for instance, it readily releases its own oxygen, so if you had ammonium nitrate and it was burning, and you tried to put out the fire or dump dirt on it, you couldn't cut off the oxygen because it produces its own oxygen.

Paul Rydlund - Direct
Q. Before coming to court today, did you prepare an exhibit that will demonstrate the manufacturing process for ammonium nitrate, for low-density ammonium nitrate, used as an explosive?
A. Yes, I did.
Q. And look on your computer screen, if you could, at Government's Exhibit 674. Do you recognize that?
A. Yes, I do.
Q. Is that the chart that you prepared?
A. That is the chart that I prepared.
MS. WILKINSON: Your Honor, we'd offer Government's Exhibit 674 as a demonstrative exhibit.
MR. TIGAR: No objection, your Honor.
THE COURT: All right. 674 is received as a demonstrative exhibit.
Which means, members of the jury, simply that it's used to illustrate or demonstrate the testimony. The document itself is not evidence. It is useful to explain the testimony.
BY MS. WILKINSON:
Q. Mr. Rydlund, you told us that once ammonium nitrate is manufactured, it usually comes out in a prill form; is that right?
A. That's correct.
Q. Can we start on the left side of the chart and let me zoom in here. And tell the jury how ammonium nitrate is

Paul Rydlund - Direct
manufactured.
A. See if I can work this.
Q. You need to go down underneath.
A. I'm sorry.
Q. There you go. You don't need to press the button; just use the pen.
A. Okay. Okay. Ammonia and nitric acid are combined in a reactor to produce an ammonium nitrate solution. The solution is pumped to an ammonium nitrate solution storage tank. At this point the solution has 10 percent water in it.
Q. And why is that important?
A. That is important because we're going to go through part of the process that is going to remove the water from the solution and put it into a solid.
Q. Okay. Let's move on to that. Here's the next portion of the chart.
A. From the tank we put the material -- the solution into a evaporator where an additional seven parts of water are removed. And from the evaporator, we put -- we pump the material to the top of the shot tower. Now, the shot tower looks just like a big silo, it's about 200 feet high. And at the top of the shot tower is a series of spray nozzles or shower heads. And so the liquid ammonium nitrate is pumped

through the shower heads and what emerges is a liquid droplet. And as the droplets fall down the shot tower, solid ammonium

nitrate crystals are formed within the droplet until we get to the bottom of the shot tower where all of the droplet is now made up of solid ammonium nitrate crystals. It's spherical in shape. It resembles, again, a miniature snowball, a millimeter in diameter, and this is what we call a prill.
Q. Is there another part of the processing that must occur?
A. Yes. Because now the prill is still a 2 1/2 percent moisture in it, and it's not very strong and it's not very durable. And that wouldn't -- because we're going to have to handle this and store it, we need to make it -- we need to make it stronger.
Q. Okay. Let's go to the final portion of the chart. Tell us what happens in this last phase.
A. So what we do is we take the material to a series of dryers and a cooler, and at this point we have removed the moisture and strengthened or made the prill more durable.
Q. And down there at the bottom, it says there's a coater?
A. Yes.
Q. Why do you coat the prills?
A. When we get to this point, when we're out of the coater, we've gone to all of this trouble to make the prill strong and durable and take the moisture out. And so what we don't want to do is to have the ambient moisture from the air come back and weaken the prill. I mean we've already gone through all of this to make it strong. So now we want to keep the humidity

from the air out of the prill. So what we do is we place it in
a coater and in the coater we spray on a surfactant, liquid surfactant or a surface acting agent, which basically coats the outside of the prill which will repel or disperse the humidity or ambient moisture in the air and then for good measure we add talcum powder to give us added protection.
Q. And all the steps you just described, the coating and the talc, are to protect the ammonium nitrate crystals?
A. They are to protect the ammonium nitrate crystals in the prill from the humidity in the air, yes.
Q. Now, before coming to court today, did you also gather a sample of low-density ammonium nitrate prills?
A. Yes, I did.
MS. WILKINSON: Your Honor, may I offer this to the -- show this to the witness?
THE COURT: Yes.
BY MS. WILKINSON:
Q. You see Government's Exhibit 675?
A. Yes, I do.
Q. Is that the sample that you collected?

Q. Is that the sample that you collected?
A. Yes, it is.
MS. WILKINSON: Your Honor, we'd offer 675 for demonstrative purposes only.
MR. TIGAR: No objection, your Honor.
THE COURT: All right. 675 is received for

demonstrative purposes.
BY MS. WILKINSON:
Q. Mr. Rydlund, could you hold up 675 and tell the jury what we're seeing in that little jar?
A. Okay. 675 is a small jar of ammonium nitrate prills. The prills are slightly off-white in cover -- color, I'm sorry. Spherical in shape, and about 1 millimeter or again 125th inch diameter in diameter. And they're free-flowing.
Q. Now, once you've completed this manufacturing process and they've been coated, what do you do with the ammonium nitrate prills?
A. From that point, we either ship it in bulk or we package it.
Q. So they're ready for storage and distribution?
A. That's correct.
Q. Let me ask you to tell the jury a little about the effects of humidity vs. water on ammonium nitrate prills and let's focus on the low-density ammonium nitrate prills.
A. Okay.
Q. Once these prills are coated, what effect, if any, does humidity have on ammonium nitrate prills?
A. In fact, the purpose of coating the prills is to prevent the humidity from attacking the prill, from weakening the prill. So the coating, the surfactant and the talcum powder, are to resist or repel the humidity in the air.

Q. So if ammonium nitrate prills are exposed to humidity, would they stay intact or would you expect them to disintegrate?
A. No, the prills would stay intact if exposed -- excuse me -- if exposed to humidity. Now, if they were exposed to humidity over months and months, we would see some changes in the structure of the prill.
Q. Could the prill break down into crystal form?
A. The prills could take -- they could break down and cake. The crystals would reorient themselves, and what we might see is that instead of free-flowing prills, we might see more of a hard mass, caking of the prills.
Q. All right. Now, let's talk about the effect of water on ammonium nitrate prills. What would happen to ammonium nitrate prills if they were -- they came in direct contact with water?
A. They would dissolve. Ammonium nitrate is very soluble in water. 200 parts of ammonium nitrate will dissolve in 100 parts of water. And relative to that, let's say table salt,

parts of water. And relative to that, let's say table salt,
320 parts of table salt per hundred parts of water, so it will
give you an idea of the relative solubility of ammonium
nitrate.
Q. Let me ask you this. If ammonium nitrate prills were on a
surface that was protected from water, from direct contact with
water but was in the same area as humidity or water, what would
you think would happen to those prills?

Paul Rydlund - Direct
A. Again, depending upon the humidity and the time involved,
the prills would either stay intact or they would probably
reorient themselves and break down into crystals.
Q. Now, once you have these ammonium nitrate -- low-density
ammonium nitrate prills ready for distribution or storage, how
do you store them?
A. Well, again, sometimes they are stored in bulk bins. Many
times they are packaged in 50-pound bags or 80-pound bags,
packaged in multi-wall paper bags, or they're sometimes
packaged in plastic bags.
Q. Mr. Rydlund, can you look inside that clear plastic bag,
and do you recognize Government's Exhibit 69?
A. Yes, I do.
Q. Is that one of the bags you just described for the jury?
A. This is a multi-wall paper bag that I just described, yes.
MS. WILKINSON: Your Honor, we'd offer Government's
Exhibit 69 for demonstrative purposes only.
MR. TIGAR: May I just look at it, your Honor.
THE COURT: Yes, come forward and do so.
MR. TIGAR: Thank you.
Thank you, sir.
THE WITNESS: Sure.
Thank you, Mr. Rydlund.
Excuse me.
No objection, your Honor.

Paul Rydlund - Direct
THE COURT: All right. 69 is received for
demonstrative purposes.
BY MS. WILKINSON:
Q. Mr. Rydlund, let's start with the outside of the bag, and
if you can turn it to the jury and explain to them what's on
the top of that bag, the markings.
A. This is the name of the company, Atlas Powder Company.
The address.
This is the name of the parent company, ICI
Explosives.
This is the name of the product, ammonium nitrate
fertilizer.
These three numbers down here, 34, zero, zero
represent the nitrogen, potassium, and phosphorous contents of
what's in this bag. So at this 34, zero, zero, zero (sic),
that means there's 34 percent nitrogen, no phosphorous, and no

potassium. Now, those numbers are important to the agricultural community because those three elements are very important to crop growth.

It says, "Prills, 50 pounds net weight," which is the weight of the bag.

This yellow diamond is a warning label for oxidizers. The flame represents that when the material decomposes, it will release its own oxygen.

This number down here, UN1942, is the United Nations

classification for ammonium nitrate, and what it means is ammonium nitrate is less than .2 percent combustibles calculated as carbon which is a long way of saying ammonium nitrate with less than .2 percent fiber.

Q. You can take your seat.

Now, look at the inside of that brown ammonium nitrate bag.

A. Yes.

Q. And can you tell the jury if that's the multi-wall paper bag that you've described.

A. This is a multi-wall paper bag, yes.

Q. What is the purpose of that type of lining?

A. The multi-wall paper bag basically consists of several walls of paper. But you notice within the walls of paper is a mil and a half of a high-density polyethylene in it. And this polyethylene lining in here is to prevent the ambient humidity from the air from entering the product.

Q. Go ahead and sit down. You told us that's an ICI product; is that right?

A. This is an ICI bag, yes.

Q. Bag. And you've been to the ICI plant?

A. Yes.

Q. Are you familiar with the practice ICI used in 1994 of selling the low-grade explosive-quality ammonium nitrate in bags such as that as fertilizer?

A. Yes. They sold low-density ammonium nitrate in bags such as this for agricultural purposes.

Q. And because it was low density, would that make it have more of an explosive capability?

A. It would have more of an explosive capability because the prills, the low-density prills as such, could readily combine with fuel oil.

Q. If someone were to purchase bags, sealed bags, of this ammonium nitrate low-density prills and store it for several months in a cool climate, let's say they purchased it in the fall and they opened it in the spring, what -- what, if any, impact or effect would there be on the prills?

A. I would expect the prills to continue to be free-flowing and intact just like this.

Q. [illegible]

Q. Even if they were stored in a storage shed?
A. Yes.
Q. You've told us that low-density prills -- and you can just put that down, if you like, so you don't have to hold onto it.
You told us that low-density prills are better for making an explosive; is that right?
A. That's correct.
Q. And that's because they're more porous and they absorb --
A. They will readily combine with the fuel oil. So that, yes, they will readily combine with the fuel oil because porosity has room for the fuel oil to absorb into the prill.

Paul Rydlund - Direct
Q. Did you ask that a photograph be taken of a low-density ammonium nitrate prill so that you could explain this concept to the jury?
A. Yes, I did.
Q. Could you look at your screen and see if you recognize Government's Exhibit 678.
A. Yes, I do.
Q. Is that the photograph that you caused to be taken?
A. Yes, it is.
MS. WILKINSON: Your Honor, we'd offer Government's Exhibit 678 for demonstrative purposes.
MR. TIGAR: No objection, your Honor.
THE COURT: Received for said purpose.
BY MS. WILKINSON:
Q. Mr. Rydlund, tell the jury what they're looking at.
A. This is a photograph taken with an electron scanning microscope of a half a section of just one of these prills. Now, because the prill itself is only about 1 millimeter in diameter, this has been magnified well over a hundred times.
This is the surface of the prill. Does that --
Q. Is your pen working?
A. I'm not sure I'm doing this.
Q. Are you pressing up against the --
A. Yeah.
Q. There you go. You're still in the box. There you go.

Paul Rydlund - Direct
A. There, I got it, okay. Well, that's bad.
Here, this out here -- I'm not very good at this.
Q. I don't think it's your fault. The pen works sometimes and it doesn't work the others. Why don't you just describe to the jury.
A. Okay. On the surface, about -- we see the surface of the prill, is the exterior of the picture. And that is the surface of the prill. The white gray areas within that surface are the ammonium nitrate crystals that were formed in the prilling process and are packed inside the prill. Now, the dark areas, the dark black areas within there are the paths and valleys between the crystals, between, and that accounts for the porosity in the prills so that when fuel oil is combined with

porosity in the prills so that when fuel oil is combined with this prill, the fuel oil enters through these paths and valleys, is dispersed and retained in there.
Q. Let me show you Government's Exhibit 681.
Now, did you collect a small fuel oil sample for purposes of demonstrating the effect of mixing ammonium nitrate with fuel oil?
A. Yes, I did.
Q. Is that what Government's Exhibit 678 is?
A. Yes, it is.
MS. WILKINSON: Your Honor, we'd offer it only for demonstrative purposes.
MR. TIGAR: No objection.

THE COURT: All right. Received. What's the number, 678?
MS. WILKINSON: 681, I'm sorry, your Honor.
THE COURT: 681, you said?
THE COURTROOM DEPUTY: 681.
THE COURT: Well, what's on that, Mr. Rydlund?
THE WITNESS: Oh, I'm sorry. Put my glasses on. Sorry.
681.
THE COURT: Thank you.
BY MS. WILKINSON:
Q. I'm sorry, Mr. Rydlund, I didn't give you the right number.
Now, can you hold up 681?
A. 681.
Q. And tell the jury what's in it.
A. This is simply No. 2 fuel oil. Just like we would burn in a diesel engine in a truck. It's just simply No. 2 fuel oil. And this is the fuel oil that is used to add to ammonium nitrate to make ammonium nitrate fuel oil or ANFO mixtures. Now, for illustrative purposes, only, I've added a red dye in this fuel oil so it shows up a little better. That's what this is.
Q. Okay. Now, would one need to actually mix fuel oil into the ammonium nitrate to ensure that it would be an effective explosive material?

A. Actually, they combine very easily. As a practice in the mining industry, what we do is we blow ammonium nitrate prills into a bin this way and then inject fuel oil another way so that there's no mixing, it just combines as it goes up into the bin.
Q. So if someone would pour ammonium nitrate into a barrel and then fuel oil, would they need to do any kind of mixing?
A. Not really; it would disperse.
Q. How long would it take to disperse?
A. Oh, depending on the temperature and everything, probably 5 to 10 minutes.

Q. For purposes of demonstrating what you've just described, did you cause photographs to be taken of a sole prill -- a prill by itself and a prill when you added fuel oil?
A. Yes, I did.
Q. Okay. Let me show you Government's Exhibit 682. Is that the photograph you caused to be taken?
A. Yes, it is.
MS. WILKINSON: Your Honor, we'd offer 682 for demonstrative purposes.
MR. TIGAR: No objection, your Honor.
THE COURT: Received. May be shown.
BY MS. WILKINSON:
Q. Now, tell the jury about the prill on the left and the prill on the right.

A. The prill on the left, on the left is ammonium nitrate. That's a half section. Again, that's just a half section of one of these ammonium nitrate prills.
On the left is ammonium nitrate fuel oil or ANFO. And
what's happened there is that the fuel oil has been added to the ammonium nitrate, and then we've taken a half section of one of those prills. And the point there is you can see, again, from the color -- and we've added the red dye in there to show the color -- how evenly the fuel oil disperses in the ammonium nitrate prill.
Q. Now, what if you mixed some other kind of fuel with ammonium nitrate? For example, a nitromethane, would you have the same absorbency?
A. With nitromethane, yes, uh-huh.
Q. Now, once you mix ammonium nitrate with a fuel, either fuel oil, nitromethane or some other type, what do you have?
A. Well, basically in that particular case you would have a blasting agent or in some cases, considering the amount of nitromethane that could be added, you could conceivably have a high explosive.
Q. Let's start with ammonium nitrate and fuel oil. What's the common name for that mixture?
A. It's called ANFO.
Q. Does your company manufacture that?
A. Yes, we do.

Q. Can it also be made by individuals?
A. Yes, it can.
Q. How difficult is it to make ANFO?
A. Actually it's very simple. It's just taking ammonium nitrate and adding fuel oil.
Q. How much fuel do you need to mix in with ammonium nitrate to make it into ANFO?
A. The optimum amount is 6 percent fuel oil, 94 percent

ammonium nitrate. That is the theoretical optimum efficiency.
Q. Can you mix different amounts and still have the ANFO become a blasting agent?
A. Yes, you can. Within a certain range.
Q. Now, can you use other types of fuel to mix with ammonium nitrate to make a blasting agent?
A. You could use nitromethane in limited quantities to do that. You could use sugar. You could use other things that have a fuel value that would provide carbon and hydrogen to the mixture.
Q. Could you use a combination of fuels like fuel oil and nitromethane with the ammonium nitrate?
A. Yes, you could.
Q. Now, you said you could mix sugar with ammonium nitrate. Do you have to do anything to the ammonium nitrate once you mix it -- or before you mix it with sugar to make it a explosive?
A. Well, if we took granulated sugar or solid sugar as we see

it, yes, because the sugar particles wouldn't be able to work themselves into the prills. So to get an intimate mixture, we would have to crush and grind ammonium nitrate and the sugar and then mix that.
Q. Have you read a book called C-4?
A. Yes, I have.
Q. In that book does it recommend grinding ammonium nitrate?
MR. TIGAR: Excuse me, your Honor, unless we have some indication that this is a source customarily relied on, that he's an expert in the field, I object to just quoting from the book.
MS. WILKINSON: My understanding is there's a stipulation about this book.
THE COURT: I believe the question being raised here is whether this witness with his expertise recognizes that book as being authoritative.
MS. WILKINSON: That wasn't the purpose of me asking the question, but let me ask a few more questions.
THE COURT: All right.
BY MS. WILKINSON:
Q. Now, Mr. Rydlund, C-4 is not a book that you normally rely on for your business, is it?
A. No.
Q. And are you aware of where that book came from, C-4? Do you know anything about the book C-4?

A. I've read the book, that's it.
Q. Do you know what the purpose of the book C-4 is?
A. According to the way the book was -- according to what I read in the book, it was to provide a recipe for manufacturing a homemade explosive that had the strength of C-4.
Q. Were you asked to read that book --
A. Yes, I was

A. Yes, I was.
Q. -- before coming to court today?
A. Yes, I was.
Q. And were you asked to determine whether the mixtures described in that book could make an explosive?
A. Yes, I was.
MS. WILKINSON: Your Honor, based on that, I would like to ask him the question about grinding.
MR. TIGAR: Sure. No objection, your Honor.
THE COURT: That cleared it up for you?
MR. TIGAR: Yes, it did clear it up.
THE COURT: All right.
BY MS. WILKINSON:
Q. In that book that purports to tell its readers how to make homemade C-4, does it recommend grinding ammonium nitrate?
A. Yes, it does.
Q. What would be the purpose of grinding ammonium nitrate?
A. The purpose of grinding that ammonium nitrate was to -- the purpose of grinding that ammonium nitrate was to be able to mix

or absorb a amount of nitromethane that was greater than the porosity of the prills would allow.
Q. And then what would happen once those ammonium nitrate prills were ground and the nitromethane was added?
A. In the amounts that they were -- in the amounts that the book suggested, then you would have a high explosive.
Q. Now, to mix ammonium nitrate with nitromethane, do you have to grind it?
A. No.
Q. So was it your understanding or is it -- what is your opinion about the recommendations in the book, in C-4, that say grind the ammonium nitrate and mix it with the nitromethane?
A. Well, in the book, if you wanted to make -- in the book what they did was to grind the nitro -- was to grind the ammonium nitrate and to add a large amount of nitromethane, greater than of course, the porosity of the prills. However, you could take ammonium nitrate prills and add nitromethane to the prills as well. But you couldn't make a high explosive by adding the ammonium nitrate (sic) to the prills. You could make a blasting agent.
Q. You mean you couldn't add it -- the nitromethane with the prills by itself is not an explosive; is that what you're saying?
A. It would not be a high explosive. It would be a blasting agent.

Q. What else would you need to detonate --
A. To detonate that, you would need a high explosive such as dynamite, TNT, high-explosive water gels such as Deta-Gel, Tovex, a number of things like that.
Q. So if you had those components, then, you could detonate

ammonium nitrate and --
A. Right, the prills without grinding them and nitromethane contents of 25 to 30 percent, I think like it talked about.
Q. Let's go back to ANFO. Is that -- you said your company manufactures ANFO?
A. Yes.
Q. Is that a popular product in the commercial industry?
A. Yes, it is.
Q. Why is that?
A. Because it's very safe to handle. It is very -- it is very safe to handle because it is not high explosive and so for handling and transportation, it's relatively safe. It is very energetic, it provides good energy when it's detonated; and it's very economical.
Q. Now, let's turn to the actual detonation of ammonium nitrate and a fuel oil. You told us you cannot do that if you have ammonium nitrate prills and a fuel oil, you need something else to actually detonate the explosive --
A. Yes.
Q. -- is that right?

Paul Rydlund - Direct
A. Uh-huh.
Q. Can you tell us what "detonation" means.
A. "Detonation" is a very violent, very, very violent chemical reaction that takes place within the explosive material itself. There is a tremendous amount of energy released, and the reason this is is because the products of the reaction, what comes out of the reaction, the gases that comes out of the reaction, the volume of them is so much -- so much greater than the volume of the explosive material itself.
Q. You also said that one would need a high explosive to detonate that; is that right?
A. Yes.
Q. What is a high explosive?
A. Well, again, a high explosive is a material that can be initiated or detonated with simply the use of a blasting cap or a detonator.
Q. Did you bring a photograph to court today that would assist you in explaining what occurs inside an explosive when it detonates?
A. Yes, I did.
Q. All right. Let me show you Government's Exhibit 692. Is that the photograph?
A. Yes, it is.
MS. WILKINSON: Your Honor, we'd offer Government's Exhibit 692 for demonstrative purposes.

Paul Rydlund - Direct
MR. TIGAR: I'm sorry, your Honor. I was looking at an exhibit.
No objection.

THE COURT: 692 is received.
BY MS. WILKINSON:
Q. Now, you just told us what detonation was.
A. Yes.
Q. Can you tell us how it's depicted here in Government's Exhibit 692 and what we're looking at.
A. I can. What we are looking at is a stick of dynamite undergoing detonation. And this may be a little -- if this pen's not working, it may be a little more -- but there is the unreacted dynamite. This is the material that's undergoing reaction, the dynamite here.

Right here -- here we go -- right here; right at the edge of that cloud is the detonation front. And this is the detonation front that's consuming the material. This detonation front moves very fast. It's moving through the dynamite at 16,000 feet per second or 3 miles a second.

Right behind the detonation front, right in here, this
area -- boy, this thing -- right in here is what we call the chemical reaction zone. And this is a very violent, energetic reaction zone. This is where the dynamite is reacting to produce the products. Inside this zone, the pressures will be a million pounds per square inch. The temperatures will be

6,000 degrees Fahrenheit. And it's this chemical reaction zone that drives the reaction that consumes the dynamite.

This cloud up in here, these are the gases that are the products of reaction of the chemical reaction zone. These gases are very hot, they're under high temperatures, and they're expanding very, very rapidly. This is a -- and right at the edge along here is a shock front that leads -- that leads the gases.

Again, and in looking at this picture, this picture was taken with a very, very high-speed camera, that this thing happened so fast, at 16,000 feet a second, you couldn't see it with the naked eye.
Q. Are you familiar with the term "velocity of detonation"?
A. Yes, I am.
Q. What does that mean?
A. "Velocity of detonation" is the rate at which the detonation front moves through the explosive. And at this case, the velocity of detonation, this particular dynamite, which is characteristic of the way a detonation front will move through it, is 16,000 feet per second or again 3 miles a second.
Q. So is that the speed of the explosion inside the material?
A. Yes, it is. Yes, it is.
Q. Do you know the range for the velocity of detonation for ammonium nitrate and fuel oil?

A. The velocity of detonation for ammonium nitrate and fuel

A. The velocity of detonation for ammonium nitrate and fuel oil will vary according to the size of the charges and how well they are initiated by the high-explosive booster, but typically

the velocity of detonation for ammonium nitrate fuel oil will range anywhere from 16,000 feet per second to 9,000 feet per second.
Q. What about the detonation -- or the range I guess I should say -- of the detonation velocity for ammonium nitrate and nitromethane?
A. Well --
Q. Again, sticking to prill ammonium nitrate, not ground?
A. For prilled ammonium nitrate, nitromethane, where we would have nitromethane content somewhere in the neighbor of about -- just in prills, in the contents of 12 percent nitromethane, let's say, we would have velocities of around 16 to 17,000 feet per second.
Q. Now, you told us that if you mixed fuel oil with ammonium nitrate, you need about 6 percent; is that right?
A. Right.
Q. And how much nitromethane do you need if you mix with ammonium nitrate?
A. Optimum, the optimum amount, theoretical optimum amount for mixing ammonium nitrate to nitromethane is close to 40 percent. The optimum amount. The problem with that is that ammonium nitrate won't absorb 40 percent of nitromethane, not even as

prills, but even in the ground state. But the optimum amount would be 40 percent.
In the ground state where the material is ground, the optimum amount it could hold is somewhere around 25 to 30 percent.
Q. Let's assume you had a lower amount of nitromethane mixed in with the ammonium nitrate. Could you still cause it to detonate?
A. Yes.
Q. And what would you need to do to cause it to detonate?
A. You would need a high-explosive booster to do that.
Q. So you could make up for that optimum range --
A. Oh, sure.
Q. -- by -- by using a significant booster?
A. Uh-huh.
Q. You just told us about what happens when a material explodes, what happens inside. Are there other effects that occur outside?
A. Yes, there are.
Q. And did you review a chart before coming to court today that explains the detonation and what occurs outside the explosive?
A. Yes, I did.
Q. Look at Government's Exhibit 691, please. Is that the chart?

A. This is the chart.
Q. Would that assist you in explaining the detonation phenomenon to the jury?
A. Yes, it would.
MS. WILKINSON: Your Honor, we'd offer 691 as a demonstrative exhibit.
MR. TIGAR: No objection, your Honor.
THE COURT: Received for that purpose.
THE WITNESS: The detonation -- it's shown before the detonation produced these rapidly expanding gases. So this yellow in here are the high-pressure gases that are moving out into the air. The -- right here at the edge is a shock front that precedes the gases as they move out. And again, right in the area of the detonation, back in here, we're looking at pressures of a million pounds per square inch and 6,000 degrees Fahrenheit.
Now, the supersonic shock front and the gases as they move out, it's moving out at about 13,000 miles per hour, and that kind of gives you the speed, for instance, of how the shock front moves out. Now, what we feel or what we see is this -- as these gases are moving out, consumed with this shock front, it's almost like a giant tidal wave that just smashes and shatters objects in its path. And so as it goes out, it moves all the air out and is shattering and smashing these objects in its path. But just like the tidal wave, at some

point in time, it moves so far out and it expends all its energy in moving all this air out that it loses strength and eventually the pressure behind -- the pressure of these gases return to normal atmospheric pressure.
BY MS. WILKINSON:
Q. And did you create another chart to explain the time phases that you've just described?
A. Yes, I did.
Q. Let me show you Government's Exhibit 693. Does that show the time phases of the blast wave?
A. Yes, it does.
MS. WILKINSON: Your Honor, we'd offer 693 for demonstrative purposes.
MR. TIGAR: No objection, your Honor.
THE COURT: Received.
THE WITNESS: This illustrates the strength or the pressure of this blast wave with time. Now, on the vertical ordinate, we have pressure, and on the horizontal ordinate is time. Now, as soon as the detonation goes off, we have this shock front right up here at the front, the blast wave, and this shock front provides like a real hammering or striking effect to anything in its path. And then right behind it is the compressive shock wave due to the gases that are coming out. And these gases are like they put on a very violent push to any object in its path.

But again as we move out and move out and the energy is expended in moving the air out, the strength of the pressure of the shock wave declines until it reaches normal atmospheric pressure. But now what's happened is we've moved all of this air out so there's nothing in here. It's a void. It's like a vacuum. So now what happens is that the air is violently sucked back into this void, and we have a negative pressure wave or a suction wave, and instead of the striking and hammering and the pushing, now we have kind of like the pulling of the objects so that what you have when a blast wave hits an object, it's kind of like a dynamic one, two punch; you strike, hammer, and then you violently push and you come right back and then you pull on the object. And it's that pulling that causes the windows to shatter and the walls to topple.

BY MS. WILKINSON:

Q. And would a blast have that effect on any object in close proximity?

A. Oh, yes, it would.

Q. Now that you've told us about how detonation occurs, can you tell us a little bit about what you need with ammonium nitrate and fuel oil to actually make it detonate?

A. Yes.

Q. Okay. Let me show you Government's Exhibit 689. Is this a chart that you've reviewed before coming to court that helps you explain that? Can you see it? Hold on.

A. Yes.

MS. WILKINSON: Your Honor, we'd offer 689 for demonstrative purposes.

MR. TIGAR: No objection, your Honor.

THE COURT: You may -- it's received, you may use it.

BY MS. WILKINSON:

Q. Mr. Rydlund, this says four-step explosive train. Can you tell us what that means.

A. Yes, it means -- this four-step explosive train tells us -- it's a diagram that tells us what it's going to take to detonate, explode an ANFO charge. Our main charge is ANFO. This is the objective. We want -- we want to be able to detonate this charge. But because it's not a high explosive, it requires a high-explosive booster, such as dynamite or TNT or other products that we mentioned before. And so over here, we have the high-explosive booster that we're going to need to detonate that in turn will have to detonate the ANFO.

Now, to initiate the high-explosive booster, we're going to need a detonator, like a blasting cap. And that's going to shoot the high explosive. And to initiate the detonator, we're going to need some type of energy to initiate the detonator.

Q. Let's start with No. 4 in the ANFO main charge, I think you called it. On this diagram, could that be any type of ammonium -- could that be ammonium nitrate mixed with any type

of fuel --
A. It could be.
Q. -- that you discussed previously?
A. It could be, as long as it was a blasting agent.
Q. Okay. And if you had a large amount of ammonium nitrate and fuel, would you need some type of container?
A. Only to --
Q. To hold it.
A. Yes, to configure the charge, yes, uh-huh.
Q. And now let's turn -- I think you mentioned that you need some kind of detonator; is that right?
A. We would need a high-explosive booster and a detonator, yes, you're right.
Q. Now, look at Government's Exhibit 685.
A. Yes.
Q. Does this depict blasting cap?
A. Yes, it does, it depicts electric blasting cap.
MS. WILKINSON: Your Honor, we'd move in 685 for demonstrative purposes only.
MR. TIGAR: No objection.
THE COURT: Received.
THE WITNESS: An electric blasting cap is a -- is a cylinder with anywhere from about 1 to 3 inches long and about a quarter of an inch in diameter. The objective of the blasting cap is to detonate the base charge, PETN, that's in

the cap.
BY MS. WILKINSON:
Q. What is PETN?
A. Pentaerythritol tetranitrate.
Q. Easy for you to say, but what it is?
A. It's a high explosive.
Q. And that's the high explosive you need to detonate the booster --
A. Yes.
Q. -- and the main --
A. That is correct, yes.
Q. Now, this says electric blasting cap. What does that mean?
A. Okay. Here's how we make -- here -- the objective to detonate the high-explosive base charge. Here's how we go about doing it. We have a pair of electric wires are connected to the cap. And electrical current is fed through these electric wires in the cap, and they pass through a small -- they pass through a small bridge wire, and they pass through a small bridge wire.
Now, this bridge wire is like the filament in a light bulb so that as electricity goes through, it gets very hot and

bulb so that as electricity goes through, it gets very hot and it glows. And so as this thing -- as this bridge wire glows and gets very hot, it ignites a very sensitive flash charge in the cap. And this flash charge in turn goes around and initiates a less sensitive but more powerful intermediate

charge, which is right here and right there.

And then the intermediate charge is strong enough to detonate the PETN high-explosive charge in the cap.

Q. So Mr. Rydlund, within this small blasting cap, you have a series of little explosions --

A. There are three different explosives materials in the cap, each one to progressively detonate to explode the PETN-based charge, yes.

Q. Is there another system other than an electric blasting cap that could be used to detonate a explosive?

A. There is another system other than electricity and these are non-electric systems as well. There are non-electric detonators as well.

Q. Okay. Let's look at Government's Exhibit 686. Is this a diagram of a non-electric blasting cap?

A. Yes, it is.

MS. WILKINSON: Your Honor, we'd offer 686 for demonstrative purposes only.

MR. TIGAR: No objection, your Honor.

THE COURT: Received.

BY MS. WILKINSON:

Q. Mr. Rydlund, briefly, could you tell the jury how a non-electric blasting cap works.

A. Non-electric blasting cap, again I have a cylinder, we have one to 3 inches long and quarter inch diameter to the cap. And

again the idea is to detonate the base charge of the PETN in the cap, which is the high-explosive material. Rather than using electricity as we did in the electric cap, this time we're going to use safety fuse, and safety fuse is inserted in this portion of the cap. Okay.

The spit of the flame from the safety fuse will hit this ignition or flash charge, will ignite this ignition or flash charge, which in turn will initiate a less sensitive but more forceful intermediate charge, which will detonate the PETN-based charge.

Q. So for this system to operate, you need some safety fuses; is that correct?

A. Yes, you do.

Q. Please look at Government's Exhibit 687. Is that a diagram of safety fuses?

A. Yes, it is.

MS. WILKINSON: Your Honor, we'd offer 687, again for demonstrative purposes.

MR. TIGAR: No objection, your Honor.
THE COURT: Received.
THE WITNESS: Safety fuse looks like a rope. It's sold in spools of about a thousand meter a spool, and it looks just like a rope. On the inside of it; right here in the middle; right -- anyway; right in the middle of the black spot; right in the middle is an inner core of black powder. Okay.

Paul Rydlund - Direct
That's about a fourth of a gram per foot of black powder that's within the core of the safety fuse. And that's what accepts the flame. Other than that, we have the -- we have some rayon and textile wrappings about the core, and then there's a wax finish on the surface of the rope.

But the idea of the safety fuse is to go ahead and to ignite the inner core of black powder. Now, unique to safety fuse is that this inner core of black powder is a very controlled burning rate. And so if you want to turn around and say, okay, I want, I want so many -- I want to light the safety fuse here and I want the flame to come out here in so many minutes, then you can determine and calculate what length of fuse you need. And conversely, if you decide I want to light the safety fuse and then I need so many minutes to retreat to a place of safety, then you can determine the lengths of safety fuse that you would need.

BY MS. WILKINSON:
Q. Is commercial safety fuse easy to obtain?
A. Yes, it is.
Q. Now, let's say you had a couple minutes that you wanted to take to get away from the scene of an explosion and you used safety fuse and this non-electric blasting cap that you're talking about. If you cut the sufficient amount of safety fuse, how would you actually detonate the explosion, how would you start the four-train process you've been describing?

Paul Rydlund - Direct
A. Well, again, in the -- again to do this safety fuse, safety fuse burns at a rate of about, for instance, in this particular case, it burns at a rate of 2 minutes for every 3 feet of safety fuse. So if you wanted 10 minutes of time, you would use 15 feet of safety fuse.
Q. And how would you light the safety fuse?
A. Okay. Safety fuse can be lit with a flame, a match. Or there are other commercial products available that will provide a flame to light the safety fuse.
Q. So if you had all the components you described, including the safety fuse, to actually detonate the bomb, all you would need was a flame?
A. Yes.
Q. Now, are there other types of initiators that you're familiar with?
A. There are other types of non-electric initiators, yes.

Q. And let me show you what's been marked at Government's Exhibit 141. You recognize that?
A. Yes, I do.
Q. And are you familiar with the system that's depicted in Government's Exhibit 141?
A. Yes, I am.
MS. WILKINSON: Your Honor, we offer 141 for demonstrative purposes only at this time.
MR. TIGAR: Yes, your Honor, no objection.

THE COURT: All right. 141 received for such purposes.
BY MS. WILKINSON:
Q. Mr. Rydlund, what is the name of this initiating system?
A. Okay. This particular system is a non-electric system, and it's a shock tube system, and this particular -- is called a shock tube system and this particular product is called a Primadet.
Q. Let's start with the orange tubing. What is that?
A. The orange tubing is the shock tubing.
Q. What's shock tubing?
A. Okay. And shock tubing is that instead of a inner core of black powder where flame burns through it, this particular tubing is dusted -- and it's hollow tubing. It's dusted with a high explosive HMX, but it's just dusted. 1 pound of HMX goes into a hundred thousand feet of tubing. So it's just dusted.
So you introduce a shock at one end of the tubing, and
then the shock travels through the tubing until it comes out the other end into the blasting cap. And it's just like a dust explosion. And so it travels at about -- this shock travels in the tubing at about 6500 feet per second.
Q. What's at the end of that orange tubing?
A. At the end of it -- at the end of an orange tube is a non-electric blasting cap, just like we looked in the fuse cap,

only instead of having the spit of the flame ignite the flash charge, the shock from the tubing will initiate the intermediate charge, which in turn will detonate the PETN-based charge.
Q. Okay. Take a look at this white piece of paper that's around the shock tube. What do you call that? It has the markings on it that says Primadet. What is that called?
A. The system for the Primadet where it says 60 feet?
Q. No, I'm talking about the sleeve, I guess. Is that called a sleeve?
A. Sleeve, yes.
Q. Holds the Primadet?
A. Yes, the extension -- it's wrapped like an extension cord, and the sleeve is the mechanism to hold it so it doesn't become

and the sleeve is the mechanism to hold it so it doesn't become all tangled up.
Q. And is that how it's commonly sold?
A. Yes, uh-huh.
Q. Now, it says "Primadet" there on the left, and it says "60 feet" on the right. What does take indicate?
A. 60 feet indicates the lengths of tubing.
Q. You mean the orange shock tube is 60 feet long?
A. The orange stock tube is 60 feet long.
Q. Do you see on the side of these tubes are little tags that say eight?
A. The tags that say eight indicate that the delay mechanism

or the delay that is built into this system, into this particular cap. And this eight refers to a delay of 200 milliseconds. And the reason that in some caps they would put a delay element in so that we can -- so that when we shoot a whole bunch of caps, a whole series of caps at the same time, every one of them wouldn't go off at the same time in a commercial blast. And by sequencing the times as when the shots go off, we can produce a better energy absorption into the rock and better breakage and less violence.
Q. Now, tell us why someone would buy Primadet for commercial purposes.
A. For commercial purposes, well, in this particular case, it's a 60-foot Primadet. That means it goes into a blast hole that's almost 60 feet deep, and the cap would go down at the bottom and be placed in a high-explosive booster. So this would be used where you would have a hole that's close to 60-foot deep.
Q. Can you get Primadet that's shorter or longer?
A. You can.
Q. Would there be any reason to buy 60-foot Primadet to blow a stump out?
A. No.
Q. Why is that?
A. Well, the -- for blowing the stump, you would -- I mean the 60-foot lead on the Primadet, it wouldn't offer you any ability

to go to safety. You'd only be 60 feet away from the stump. And that's -- that's too close. You certainly wouldn't want to do that.
And because it shoots at 6500 feet per second through the tubing, I mean you have no -- I mean, you're there, boom, and that's it. So it doesn't offer you enough distance to be able to do that. And if you were going to use it, you would have to add, hook something onto the end of the tubing to be able to get far enough away.
Q. Okay. But normally you use this tubing to go down a hole 60 feet?
A. It's strictly a commercial product, and frankly it's used

for blast holes that are almost 60 feet deep.
Q. What about a time delay of eight, would there be any reason for someone who wanted to blow a stump out to use a time-delay system?
A. No. No.
Q. Why is that?
A. Because basically you're looking to instantly shoot the powder under the stump.
Q. Now, let's go to the last part of the train and go back to Government's Exhibit 689.
A. Yes.
Q. You said that if we have a safety fuse and some kind of detonator, which I assume are those blasting caps you talked

about; right?
A. Correct.
Q. And we have a main charge of ammonium nitrate and some fuel, all we need is a booster; is that right?
A. We need a high-explosive booster, that's correct.
Q. What type of materials are used as high-explosive boosters?
A. You can use cast TNT, you could use cast Pentalite, you could use cast composition B. You can use dynamite. You can use high-explosive water gels such as Tovex, Deta-Gel, to name a couple. There are high-explosive emulsions made. Any product that will reliably detonate with a blasting cap is a high explosive.
Q. What about detonating cord?
A. Detonating cord would be as well.
Q. And can you look at Government's Exhibit 690.
A. Yes.
Q. Is this a picture of detonating cord?
A. Yes, it is.
MS. WILKINSON: Your Honor, we'd offer 690 as a demonstrative exhibit.
MR. TIGAR: No objection, your Honor.
THE COURT: Received.
THE WITNESS: Okay.
BY MS. WILKINSON:
Q. Tell us what detonating cord is.

A. First of all, detonating cord, again, is like a big old rope, just like a big old clothesline. And it's about -- and it's sold in spools of 2,000 feet to 1,000 feet. That's what it looks like. Inside the detonating cord, inside the inner core of the explosive, is PETN. And depending upon the grade of detonating cord you buy, the loading of the PETN inside the detonating cord can be anywhere from 50 grains per foot to about 7 1/2 grains per foot. So there are a variety in there.
Now, the PETN -- and then covering the PETN is a series of covering yarns, plastic jackets, textile yarns, again

for protection and handling. PETN within the detonating cord itself will detonate at 27,000 feet per second, so it's pretty fast.
Q. Now, it's not safety fuse; right?
A. No. No. No. No. Remember the safety fuse was -- safety fuse was black powder, it was lit with a flame that we had 3 feet or, you know, we had like 3 feet for every 2 minutes.
So in this particular case, no, this is a high explosive; and this detonates at 27,000 feet per second.
Q. Now, you also mentioned a product called Tovex. Are you familiar with that product?
A. Yes, I am.
Q. What is that product?
A. It is a water gel that is sensitive to blasting cap that will detonate, reliably detonate with just a blasting cap.

Q. Now, did you help prepare a chart that showed possible bomb components that you would need to make a ammonium nitrate and fuel oil device?
A. Yes, I did.
Q. Let me show you Government's Exhibit 1298. Do you recognize that?
A. Yes.
MS. WILKINSON: Your Honor, we'd offer 1298 for demonstrative purposes.
MR. TIGAR: No objection, your Honor.
THE COURT: Received.
THE WITNESS: And this basically is a list of materials, list that we would need. We would need an oxidizer such as ammonium nitrate. We would need sensitizer such as fuel oil or nitromethane. We would need the high-explosive boosters, such as dynamite, Tovex, TNT, Pentalite. We would need the detonators, whether they be non-electric or electric. And we would need a container to configure the charge.
BY MS. WILKINSON:
Q. Once you had obtained all these components, is there a specific recipe you have to follow for building this device?
A. Well, we have to go ahead -- as far as a specific recipe, we have to configure the situation just like we showed the four-step explosive train.
Q. But can you use different combinations of explosive to

detonate ammonium nitrate and fuel oil?
A. Yes, I was just using those as examples. There are a number of them that could be used.
Q. And could you combine -- could you have dynamite and Tovex as your booster?
A. Yes, I could. I could take dynamite, Tovex, detonating cord -- for instance, I could take Tovex or dynamite, wrap detonating cord around it, and initiate the detonating cord

with a blasting cap, either electric or non-electric, shoot the detonating cord, shoot the Tovex. A number of combinations are possible.
Q. Once you have these components, how difficult is it to build an ammonium nitrate and fuel oil device?
A. It's very simple.
Q. And how difficult or easy is it to obtain these components?
A. Many of these components -- oxidizers, ammonium nitrate, the materials that are not explosives themselves, you know, could be purchased. Ammonium nitrate can be purchased from fertilizer locations, co-ops, places, feed and seed stores, garden supply stores. I mean you could get ammonium nitrate from there.

Fuel oil can be purchased from the local fuel -- you know, fuel oil dealer or distributor.

Nitromethane may be obtained from places -- there are distributors that sell nitromethane -- be obtained from there.

It might be obtained from a chemical supply house.

Containers can be purchased almost anywhere -- which brings us back only to the high explosives and to the -- high-explosive materials and to the blasting caps or the detonators. Those are high explosives, and the commerce of those articles are controlled by the ATF. And what that requires is that you -- if you were to buy those interstate, you simply go -- you could go to an explosive distributor, you fill out a form that basically gives -- you show them a driver's license, Social Security number, and then you fill out a form indicating you've never been convicted of a felony or drugs or this; and then those, according to the ATF rules, can be sold to you and you could purchase them.

Now, in some states -- there are about 27 states which
have their rules in addition to the ATF rules as well. But in most of these states, their rules are no more stringent than the ATF rules.
Q. Now, some of these items, do you need a blaster's license to purchase these items?
A. Depending upon the state. Because what happens in the states -- for instance, some states, the fire marshal has control, department of labor has control, department of mines and minerals has control. So, no, there are locations you could purchase them where you would not have to have a blaster's -- a blaster's license.

Q. Can you tell the jury how much it costs to buy a bag of ammonium nitrate prills?
A. Oh, 50-pound bag of ammonium nitrate prills would cost about $5.
Q. And a gallon of fuel oil?
A. Oh, probably diesel fuel oil, selling for, what, 80 cents,

A. Oh, probably diesel fuel oil, selling for, what, 50 cents, a dollar a gallon, something like that.
Q. Now, if you had a large quantity of ammonium nitrate and the proper amount of fuel oil, you said to us it wouldn't be difficult to mix those two -- is that right -- as long as you had some kind of container?
A. Uh-huh.
Q. How difficult would it be to boost that with a high explosive?
A. Well, you could take the high explosive, you could either set it in the material, or you could set it adjacent to the material.
Q. Let's say you had a series of barrels --
A. No. By "adjacent," I mean like touching. Touching.
Q. Let's assume you had a series of barrels: Would you need to boost each barrel of ammonium nitrate and fuel oil before you could --
A. No, the detonation would be sympathetic. If you detonated one barrel, the ANFO charge on that basis is strong enough to detonate all of the other ones. I mean, basically what you get

is just -- even with ten barrels, you just got one big, you know, you got one charge times ten barrels.
Q. Now, what if you wanted to transport this device, if you had the ammonium nitrate and fuel oil in the containers, if you kept the high explosive separate from them: Would it be safe to transport the device?
A. Yes, it would be. Ammonium nitrate/fuel oil mixtures are transported daily.
Q. Now, if you had all the components that we're talking about and you had 4 to 6,000 pounds of ammonium nitrate, how difficult would it be to construct an explosive device?
A. It would not be -- it would not be difficult.
Q. Even with that quantity of ammonium nitrate?
A. Even with that quantity. It would take some time, but one person could do it.
Q. Could two people do it?
A. Two people could do it.
Q. And could more than two people do it?
A. Yes.
Q. Now, before coming to court today, did we ask you to review portions of a book called the Hunter?
A. Yes.
Q. Did you review the entire book?
A. Yes.
Q. I'm going to show you Government's Exhibit 158B, from page

176 of the Hunter. Do you recognize that?
A. Yes.
Q. Did you review that before coming to court today?
A. Yes, I did.

MS. WILKINSON: Your Honor, we'd offer 158B for demonstrative purposes only.

MR. TIGAR: We object, your Honor. He can read it into the record. We object to that form.

THE COURT: It's just for demonstrative purposes. It won't go into the evidence to go to the jury. So it will just be used at this point. So you may do it.

MS. WILKINSON: Thank you, your Honor.

BY MS. WILKINSON:

Q. Now, Mr. Rydlund, it says here that someone bought 15 bags of fertilizer-grade ammonium nitrate; is that right?

A. Yes.

MS. WILKINSON: I'm sorry. Your Honor, the screen is not on for the jury. Thank you.

BY MS. WILKINSON:

Q. And can you read after that, where he said he would have bought more.

A. Yes.

Q. Go ahead. Can you read it out loud.

A. You wanted me to read it. He would have bought more, but 1500 pounds was as much as he estimated he could manage in one

load without damaging his truck.

I assume he had a three-quarter-ton pickup.

"After unloading that in the garage, he stopped at a hardware and farm-supply store and bought two 50-pound cases of Tovex cartridges [which would be the high-explosive water gels that I had talked about] and a box of electric detonators. Tovex was an aluminized water-gel dynamite commonly used by farmers and contractors for blasting stumps and boulders."

Q. Would all of those components work to -- if you had those, to make an improvised explosive device of ammonium nitrate?

A. Yes, it would.

Q. Now, look at 158C --

MS. WILKINSON: Your Honor, I'd offer this whole series in as demonstrative exhibits, 158C, D, E, F -- E and F.

THE COURT: Just being used for that testimony.

MS. WILKINSON: That's all.

MR. TIGAR: Our objection is noted, your Honor.

THE COURT: Yes. The objection is overruled. You may proceed.

BY MS. WILKINSON:

Q. Okay. Could you read this portion of the Hunter, please, from page 179.

A. "In his rented garage he removed several five-gallon cans of wallpaper adhesive and dozens of rolls of wallpaper from the back of the van, replaced them with four 40-gallon plastic

trash barrels he had purchased earlier in the day, and spent

the next three hours emptying sacks of ammonium nitrate into the barrels and stirring a fuel-oil sensitizer into the white pellets. The barrels were closely grouped around one of his 50-pound cases of Tovex. It was after four o'clock in the morning when he finally was ready to place a time-delay detonator in the Tovex."
Q. Mr. Rydlund, if someone followed these instructions and mixed ammonium nitrate and fuel oil in plastic trash barrels and surrounded them -- or they surrounded a box of Tovex, would this be sufficient to, in part, to construct an ammonium nitrate improvised explosive device?
A. Yes, it would.
Q. Let me show you Government's Exhibit 158B. And we don't need to read this into the record but you may recall discusses driving a truck full of those components up close to a building. Do you recall reading that?
A. Yes.
Q. And let me show you Government's Exhibit 158D. Do you recall this portion? Describes driving up --
A. Yes.
Q. -- closely to tightly curtained windows to George's rear wall. Can you read that next sentence where it says, "He leaned back."
A. "He leaned back into the cargo area just long enough to set

the detonator to five minutes and started counting down."
Q. Now, would that have given -- if someone followed the instructions that we've seen so far and followed these instructions, would that have given someone sufficient time to get away from the seat of the blast?
A. Yes.
Q. Now, look at Government's Exhibit 158E. Did you read that before coming to court today?
A. Yes, I did.
Q. And that describes the damage that was caused and the deaths that were caused due to this improvised explosive device; is that right?
A. That's correct.
Q. And is consistent with your understanding of the detonation velocity and damage patterns of an improvised ammonium nitrate device?
A. Of the detonation velocity of ammonium nitrate, blasting agents, and of the quantities that were discussed earlier in the book, yes. That is correct.
MS. WILKINSON: We have no further questions, your Honor.
THE COURT: I think we'll take the recess before cross. I assume you have substantial cross-examination.
MR. TIGAR: Lengthy, anyway. I hope it's substantial, your Honor.
THE COURT: All right.
We'll take a recess at this time. You may step down, Mr. Rydlund.
THE WITNESS: Thank you.

THE WITNESS: Thank you.
Members of the jury, we will take our 20-minute break at this time with the usual cautions, of course, of avoiding discussion of anything connected with the case, anything you've heard in connection with the case, keeping open minds.
And we'll resume this testimony in 20 minutes. You're excused.
(Jury out at 2:57 p.m.)
THE COURT: 20 minutes.
(Recess at 2:58 p.m.)
(Reconvened at 3:21 p.m.)
THE COURT: Be seated, please.
Some jurors have asked to change the lighting there, so that's why we turned some of those lights. They thought there was a glare.
MR. WOODS: Keep them awake.
(Jury in at 3:22 p.m.)
THE COURT: Is the lighting better for you now?
I'm not going to put it to a vote. We'll try it this way.
Bring in the witness. Please resume the stand.
Mr. Tigar, you may inquire.

Paul Rydlund - Cross

CROSS-EXAMINATION

BY MR. TIGAR:
Q. Good afternoon, Mr. Rydlund.
A. Good afternoon.
Q. My name is Michael Tigar. I'm one of the lawyers that's appointed to help out Terry Nichols; and you are familiar with cross-examination, are you not?
A. Yes.
Q. You have been cross-examined before?
A. Yes, I have.
Q. And sometimes at home at your house, you hear about it, don't you?
A. Yes, I do.
Q. And that's because your wife's profession's -- she's a public defender in St. Louis, isn't she?
A. Yes, she is.
Q. Would you take -- could we start -- please, would you pick up that bag that you had the Government's Exhibit 68; and can you --
MR. TIGAR: May I approach the witness, your Honor?
THE COURT: You may.
BY MR. TIGAR:
Q. Down here inside the bag are -- looks like little stipples, little white marks on there. Is that from the coating of the prills that left that deposit on there?

A. Let me --

Q. If you could just look carefully.
A. Let me lay it like this and I'll -- these are some prills down here, but you're not talking about these.
Q. Right, okay -- well, let's stop and talk about that for a minute. So one thing that's left in are some of the prills are actually inside there; right?
A. Yes.
Q. Did you shake that bag out, or was that provided to you empty?
A. This was provided to me like this.
Q. But the prills have this tendency to -- to kind of stick to things; right?
A. With enough humidity, yeah, sure.
Q. And now we're going to ask about this. Can we just turn it inside out for a minute?
See the -- kind of the white stippling on there?
A. Uh-huh.
Q. Can you tell me what's that from? That is from the coating that you put on at the factory?
A. I can't tell you whether this is from the coating or this is from the prills themselves.
Q. All right. So you just don't know what the chemical composition of those things is without further looking?
A. Of those stipples?

Q. Of those stipple things.
A. I couldn't attest. No, I couldn't.
Q. Okay. That's all I want to ask about that. We'll put it out of your way, sir.
A. Thank you.
Q. Now, I put up on the board here --
MR. TIGAR: And the Government has agreed to let me do
this, your Honor --
BY MR. TIGAR:
Q. I've written a formula here, if we could show that.
A. Uh-huh.
MR. TIGAR: And if we could exhibit that to the jury, also. I think the Government is agreed.
MS. WILKINSON: No objection.
THE COURT: All right.
BY MR. TIGAR:
Q. Have I got this right?
A. Yes.
Q. That is ammonium nitrate?
A. That is the chemical formula for ammonium nitrate.
Q. So that's one molecule of ammonium nitrate. Correct? I mean, if you -- and so ammonium nitrate is made of the NH4 part. What's that?
A. Well, it's nitrogen, hydrogen. Uh-huh.
Q. So that's one of nitrogen and 4 hydrogen. Right?

A. Yes.
Q. And the NH4 together: Would that have a name?
A. It's an ammonia radical. It would be an ammonium radical, I guess, yes.
Q. And the NO3?
A. Is a nitrate radical.
Q. So that's nitrogen and three parts oxygen; right?
A. That's correct.
Q. Okay. Now, one of the uses of ammonium nitrate is as fertilizer. Correct?
A. That's correct.
Q. And in its use as fertilizer, it goes by the name "34-0-0"; correct?
A. Yes.
Q. And so if I --
MR. TIGAR: If I may display that, your Honor.
THE COURT: Yes.
MR. TIGAR: Yes, please, Ms. Hasfjord.
BY MR. TIGAR:
Q. So on a bag of ammonium nitrate, I would find a 34 and a zero and a zero. Correct?
A. That's correct.
Q. So that if I'm a farmer that wants to use this or a gardener, a home gardener, I would know that it's 34 percent what, nitrogen?

A. Nitrogen.
Q. And then zero percent?
A. Phosphorus.
Q. Phosphorus. And zero percent potassium?
A. Potassium.
Q. All right. And the chemical symbols are N, P, K. Is that right?
A. That's correct.
Q. Now, you mentioned that there is a big plant near -- in Joplin, Missouri, that makes ammonium nitrate. Is that right?
A. Yes.
Q. And is that in the center of an agricultural area?
A. It's close to -- I can't say that it's in the center of the agricultural area, but it's close to an agricultural area near Springfield, Missouri.
Q. And that's owned by ICI; correct?
A. Yes.
Q. And at that plant, do they make just the low-density ammonium nitrate prills, or do they also make the high-density ammonium nitrate prills?
A. They make the low-density ammonium nitrate prills.
Q. Now, when they sell the ammonium nitrate out at that plant, do they sell it in bags as well as bulk?
A. Yes.
Q. And when they sell it to farmers in a bag such as the one

you're looking at here, do they label it low-density, high-density?
A. Two things. I don't believe ICI sells it directly to farmers. And again, I'm not in the agricultural marketing part of it, so I couldn't speak to it; but to my knowledge, they don't -- they don't sell it to farmers.
However, they bag it and they do put it in their bags.
And it is not -- in the ones that I have seen and am familiar with do not say low-density ammonium nitrate nor high-density ammonium nitrate.
Q. Okay. That was the question.
A. I'm sorry.
Q. We understand. The farmer doesn't drive up to the big ICI plants and say, "I'm planting today, just load my truck"; right? They go to a store and buy it. Correct?
A. Yeah. And again, I don't believe ICI sold directly to the distributors, either.
Q. But the bag we saw today, for example, is a bag of ammonium nitrate prills manufactured by ICI?
A. That's correct.
Q. And that bag, at any rate, did not have a label as to whether it's low-density or high-density. Correct?
A. That is correct. That is correct.
Q. So that if I were a person who particularly wanted low-density ammonium nitrate prills and I went to a farm store

where ammonium nitrate was sold in bags, there is no way I could tell by looking at the bags whether it was low-density or high-density. Right?
A. That is correct.
Q. Okay. Now, the difference between low-density and high-density -- I mean, I understand one is high and one is low -- the low-density has a specific gravity of about what?
A. It has a specific gravity of about .80.
Q. .80. And this is a cup of water. If I put my finger in it and let a drop fall, the drop that -- there is another one -- that falls off there is about the size of an ammonium nitrate prill -- right -- more or less?
A. Again, if it's a droplet. I understand.
Q. I'm not trying to be specific here.
A. I understand, sure.
Q. Now, if I had some ammonium nitrate that was the size of low-density ammonium nitrate prill, the size of the droplet that fell from my finger, it would weigh 80 percent of what the water droplet does?
A. That's correct.
Q. Okay. And that's what the --
A. With the same volume, you're right.
Q. Okay. Now, a high-density ammonium nitrate prill has a

Q. Okay. Now, a high-density ammonium nitrate prill has a specific gravity of what?
A. Well, high-density ammonium nitrate prills have a specific

gravity closer to 60 pounds a cubic foot or 60 divided by -- so it would be closer to .9 or a little bit higher.
Q. So a difference of -- well, if it's 80 to 90, 12 1/2, 13 percent more?
A. Yeah, it's close.
Q. Now, in fact, sir, high-density ammonium nitrate prills can be used to make an explosive device when combined with fuel oil and something else; correct?
A. Yes. They could be -- and something else. That's correct.
Q. And the something else is carbonaceous black. Is that correct?
A. Yes. That's true. But I'm sorry: Did you say high-explosive device?
Q. No, I said an explosive device. A blasting agent. And if my terminology is wrong, would you correct me.
A. Can be used to make a blasting agent, that's correct.
Q. In fact, sir, in 1970 -- you're smiling.
A. I know. Go ahead.
Q. You know. Tell us what happened in 1970 that lets you tell me that you can use high-density prills to make a device.
A. In 1970, I authored a patent using carbon black, a mixture of carbon black and fuel oil.
Q. Right.
A. And that was used to make an explosive device. It was a great patent. I mean, to me it was a good idea.

Unfortunately, the operation was a success but the patient died. It had no practical value.
Q. The market has never picked up on this idea that you and your colleague had. Is that right?
A. No. And actually, to be honest with you, there were some problems with it. The carbonaceous black and the fuel oil -- it's almost like a slurry. It was very sensitive to flame. That was the biggest problem. It couldn't be commercialized because it was too hazardous to handle.
Q. Okay. When you say very sensitive to flame, I want to get another basic fact out here. You said that if ammonium nitrate catches fire that it's hard to put out.
A. I said that if ammonium nitrate catches fire, it produces its own oxygen, so you can't -- so if you try to suffocate it, if it was a fire and it was in a -- and it was in a -- in an area where, you know, you'd tried to batten down the hatch and not let the air get to it, it would still produce its own oxygen. But no, an ammonium nitrate fire can be extinguished by water.
Q. It can?
A. Yes.

Q. Okay. And when -- at what temperature does ammonium nitrate start to burn?
A. I would have to go back and consult. I couldn't say off the top of my head, but it's a very high temperature. But I

don't have that number readily available.
Q. When you say very high, over a thousand degrees Fahrenheit, or is it --
A. I'd have to go back and look at my numbers.
Q. Sure. And do you know at what temperature fuel oil starts to burn?
A. The temperature where fuel oil will spontaneously ignite, no, I don't have that particular number with me.
Q. Do you know at what temperature nitromethane starts to burn?
A. I don't have that number with me, either.
Q. It wasn't mentioned earlier today, but do you know of a substance called anhydrous hydrazine?
A. I've heard of it, and it had a very short life in the commercial explosive industry.
Q. So it's not used any more for commercial explosive so far as you're aware.
Was it used, do you know, for commercial ANFO-type explosives?
A. The only use that I'm aware of -- it was used in -- as a binary explosive.
Q. All right.
A. So it wouldn't be used in commercial mining ventures, no.
Q. Now, what's a binary explosive?
A. Where ammonium -- a binary explosive would be like what

they call a two-component explosive; and for instance, a product called Kinepack or T100, where you have a bottle of crushed ammonium nitrate and you have a bottle of nitromethane and you pour the nitromethane into the ammonium nitrate and this makes a -- this makes a high explosive, and then it can be detonated by a blasting cap. And they tried to do the same thing with anhydrous hydrazine.
Q. Now, looking first to the agricultural use of ammonium nitrate, you don't have a lot of experience in that field; is that right?
A. I am not involved in the agricultural business, but no, I don't have -- I would consider not a lot of experience in the agricultural business; that's right.
Q. Do you know how many pounds of ammonium nitrate are used on the commercial side every year; that is to -- excuse me -- the agricultural side every year.
A. I'm trying to -- I'm trying to remember offhand what it is. I do, but I don't recollect the number. I mean, what I'm saying is I know, but I don't have the number with me.

Q. All right. Well, for explosive purposes, how many pounds of ammonium nitrate are used annually in the United States, let us say, in the most recent year --
A. I'm sorry.
Q. -- in the most recent year that you know?
A. Okay. In the most recent year that I know, basically what

we're looking at is somewhere in the neighborhood of about, oh, 2 million tons.
Q. That's 4 billion pounds?
A. Yes.
Q. Is that right?
A. Uh-huh.
Q. So 4 billion pounds of this stuff are used annually for explosive purposes; right?
A. (Witness nods head.)
Q. Now, who uses all this stuff?
A. The -- I'm sorry.
Q. Let's start -- first you mentioned that it's used by rock -- for rock blasting?
A. Uh-huh.
Q. And that's used for quarrying and mining?
A. Uh-huh.
Q. Is it used for construction purposes, construction excavation?
A. Uh-huh.
Q. Is it used by farmers?
A. Is it used by farmers? I -- it could be used by farmers for stump-blasting, for maybe trench-shooting, although I don't know if the farmer would do that himself. He would probably get, you know, an explosive distributor or somebody to hire. Maybe not for stump-blasting. However, that amount would be

very, very small.
Q. And you say for trench-shooting?
A. Ditch-shooting. It could be used for ditch-shooting.
Q. What is that, sir?
A. Ditch-shooting is basically if you were going to go ahead and shoot a ditch or a trench.
Q. So that would be lining up a series of charges all in a row and then you make it go boom?
A. That's correct.
Q. And then you don't have to dig it out with a -- with a pick and shovel?
A. Uh-huh.
Q. And you could also use it for a pond, for making a pond; right?
A. You could.
Q. Now, can ammonium nitrate explosives, if they're properly packaged, be used in an environment where there is water?
A. There are ammonium nitrate explosives that are used -- can

A. There are ammonium nitrate explosives that are used -- can be used in certain water conditions.
Q. Now -- and in fact, the Primadet that we saw is waterproof; correct? The cord itself?
A. The Primadet can be used in water conditions, yes.
Q. Yes. And -- well, you mentioned ammonium nitrate explosives, and we've been using these terms interchangeably. Ammonium nitrate -- that is, the chemical NH4NO3 -- is used in

many explosive products, isn't it?
A. Yeah. It's used in a number of explosive products. That's correct.
Q. And when we talked about the 4 billion pounds earlier, were you talking only about use of it for ANFO purposes, or was that for all explosive purposes?
A. That was for ammonium nitrate used in all explosive products.
Q. And what are some other explosive products in which ammonium nitrate would be used?
A. Besides ANFO?
Q. Yes, in addition to ANFO.
A. In addition to ANFO, they could be used in water gels.
Q. What is water gel?
A. Water gel is a mixture of solid ammonium nitrate, liquid ammonium nitrate, sensitizers or fuels, and a gelling agent which basically puts together a product that is called a water gel, and it's called that because it resembles Jell-O. And so that is a product that is used in ammonium nitrate.
Q. So finding ammonium nitrate residues at the scene of a blast doesn't uniquely identify ANFO as the cause of the blast. Correct?
A. Finding ammonium nitrate crystals?
Q. No, residue.
A. Residue?

Q. Yes. We haven't talked about crystals yet. Just residues generally.
A. Okay. Finding there -- that's right. I mean, it could be from water gels.
Q. All right.
A. Product such as a water gel.
Q. Now, sir, I want to ask you about a characteristic of ammonium nitrate. You said that -- excuse me. You said it's very sensitive to water. Is that correct?
A. It's very soluble in water, yes.
Q. Very soluble. And is that characteristic referred to as "hydroscopic"?
A. Well, in my opinion, hydroscopic is the ability to attract moisture, the ability for moisture out of the air. And to me that means the ability to trap moisture out of the air, such as table salt. And it probably -- but solubility is the ability

to dissolve in water.
Q. Yes, sir.
A. But ammonium nitrate is hydroscopic; and again, it does have the ability to attract moisture out of the air.
Q. Now, have you ever attempted to test the -- and how do you spell -- is it hydroscopic or hydroscopic? Should I be saying, the word -- the --
A. H-Y-D-R-O.
Q. Hydroscopic. Just like hydrant, water.

A. Hydro, uh-huh.
Q. Yeah. And if I took a small quantity of ammonium nitrate prills, crushed and placed them in a watch glass, which is a small glass container, and I subjected them to 98 percent humidity, what would happen to the crushed ammonium nitrate?
A. So you have 98 percent humidity at what temperature?
Q. Standard temperature and pressure, so that means we've got to go back down to sea level and 90 degrees. Well, that's not standard temperature, but let's --
A. Okay. But anyway, like a very hot, humid day --
Q. Like a hot, humid day.
A. -- is what we're trying to say, and you place them in a watch glass.
Q. Now, by watch glass -- you've used those in chemistry class?
A. Uh-huh.
Q. And that's just a small -- looks like a tiny, little saucer?
A. Uh-huh. That's correct. Yes.
Okay, placed in that humidity and we placed the prills -- we place the prills.
Q. I said crushed prills in my first example, sir.
A. So we place -- so we have an agglomeration of crystals in there. Okay. All right. And we placed it to the humidity, and the first thing that would happen would be, subjected to

the humidity -- that is, the humidity would attack the surface of the crushed prills and they would try to draw together and they would cake. And so the flow-ability of these crushed prills lying like this all of a sudden would become more of a solid mass, is what they would do.
Q. And would there come a point at which the -- we would find a puddle in our watch glass under these conditions?
A. Could you find a point at --
Q. Just a puddle; that is, we wouldn't see any --
A. Depending upon -- depending upon the amount of grains of moisture that they were subjected to and the amount of material that was there -- so it could be. So if you had two or three little crushed prills and you subjected it to humidity where you had so much moisture for several weeks, yes, you could.

Q. And -- well, do you have an opinion as to how much time it would take for the puddling effect to occur with a small quantity, 5 grams, let's say, of crushed prills in a watch glass under 98 percent humidity conditions?
A. At that particular time, I would probably say it could be -- let's say we're talking 100 degrees Fahrenheit, with 98 humidity -- and I don't have a chart with me to tell me how much moisture is in the air. But in my opinion and from the tests that I've run when I worked at Monsanto, I would say it would probably be somewhere in terms of a week.
Q. You don't -- you think it would take that long?

A. Again, I'm trying to look at how much moisture -- you know, how much moisture, and I'm looking at maybe -- 5 grams of prills and depending upon the exposure and everything. It could be a week, I would say. Probably. Probably a week.
Q. Have you ever done that experiment?
A. Not with 5 grams. That's the problem I'm having trying to relate to. I mean, I've done it more with like 50 grams, and I've run it in temperature humidity cabinets; and that's what I'm trying to recall. So I'm trying to extrapolate from that.
Q. Sure. 50 grams is just shy of 2 ounces; right?
A. Well, 50 grams is -- I'd have to go through the deal again, but 450 divided by 50, so that's about a 9th of a pound, I guess. I'm trying to get back to my ounces. Is that -- I'm trying to think, 16 ounces a pound, probably about 2 ounces. Okay.
Q. Now, you mentioned that if someone were going to make a device made of ammonium nitrate and fuel oil that they would then -- this person, whoever that was, would want to get the low-density prills; right?
A. To absorb the fuel oil; that is correct.
Q. And the low-density prills, then, if you had a barrel with a bunghole in the top of it and just poured the diesel in, after 10 minutes or so, it would be absorbed; right?
A. Yeah, in my opinion, it would be, uh-huh.
Q. So that you wouldn't have to take a paddle and stir the

stuff; right?
A. No. It would absorb. That's correct.
Q. In fact, somebody that took a paddle and started stirring the stuff would show that they didn't really understand the process very well; correct?
A. Well, I don't -- I mean, I don't know if that would -- I don't know if that would be true or not. I couldn't say that. I mean, it would seem, naturally, if you're going to combine two things, if you can stir them, fine. I mean, our experience is when they're just combined going into a blowpipe up to the top of the bin, when we combine it we don't have to sit there and have a mixer inside. But in normal cases, a lot of people use a concrete mixer

use a concrete mixer.
Q. So it's not necessary to stir?
A. Well, in this particular case to combine it, no. They will disperse in time.
Q. Now, on this subject, if I wanted to find out how to make an explosion using ammonium nitrate and fuel oil and say I'm a farmer, I wanted to blow stumps, where would I go to find that out?
A. If you wanted to blow some stumps and get some ammonium nitrate fuel oil to blow the stumps?
Q. Right. I bought some land and I want to deep-break it but I don't want to bring in heavy equipment. I want to blow the stumps out.

A. You might go to an explosive distributor.
Q. Okay.
A. You might know somebody that works at a mine that does blasting in a mine that may be able to help you. There may be literature available on the Internet, in book stores or sold through different books that may tell you how to do it.
Q. Sure. Well, let's take those one at a time. If I go to an
explosive distributor, would I find some of your products there?
A. You might.
Q. And when I found your products there, would I find instructions on how to use them?
A. Complete instructions as to how to blow a stump?
Q. Yes, sir.
A. No.
Q. So we couldn't get it there.
Now, if I found somebody that worked in --
A. I'm sorry.
Q. Excuse me, sir.
A. You might ask them how to do it.
Q. Oh, I see. In other words, I could walk in the door and say I want to buy this and this and this and how do I do it, and they would tell me.
A. They might.
Q. They might, if I looked like the sort of person that they

could trust with the information?
A. Depending upon the circumstance, the individual, if they knew you and things like that. That's correct.
Q. You're in the business of selling these things to people, and so you want them to buy them and use them responsibly; right?
A. That's correct.
Q. And in order for them to be purchased by many people and used responsibly, there has to be a way for them to buy them and find out how to use them. Correct?

and find out how to use them." Correct?
A. That's correct.
Q. Another source you mentioned was the Internet. Have you ever looked on the Internet?
A. No, sir, I have not.
Q. Okay. We'll stop right there.
Have you ever -- are you familiar with an outfit called Paladin Press?
A. I'm familiar that I believe they have published a couple of -- I believe they have published a couple of books, some books -- Hunter.
Q. You think they published Hunter?
A. I'm not sure. I've seen Paladin Press before, and I'm not completely sure without looking at it whether they did or didn't, but I believe they've published a couple of books related to -- that have some involvement with explosives.

Paul Rydlund - Cross
Q. Well, in fact, sir, isn't Hunter published by something called National Vanguard Books?
A. It may be. It may.
Q. Okay.
A. It may be, and again I said -- I remember seeing the name. I can't recall which book I saw it in.
Q. But have you ever seen any books published by Paladin Press that tell you how to make an ANFO explosive device?
A. Well, if I can't recall the books that I've seen the Paladin Press name on, then I would have to answer you -- I can't answer your question.
Q. And have -- have you also read publications that describe the safety precautions that you should take when handling ammonium nitrate/fuel oil mixtures?
A. Yes.
Q. And now are you familiar with the Manufacturing Chemists Association Fertilizer-Grade Ammonium Nitrate Properties and Recommended Methods for Packaging Handling, Transportation, Storage and Uses?
A. Yes.
Q. Are you familiar with the National Fire Protection Association publication Manufacture, Storage, Transportation and Use of Explosives and Blasting Agents?
A. I'm familiar with seeing that. I haven't read that in a while.

Paul Rydlund - Cross
Q. Okay. Have you read the Bureau of Mines' information circular, Safety Recommendations for Sensitized Ammonium Nitrate Blasting Agents?
A. Yes, I have.
Q. Now, what's a sensitized ammonium nitrate blasting agent? That's not one that's been in therapy, is it? That's one that's been prepared to explode --
A. That's correct.

Q. -- is all that means.
A. "Sensitized" means for ammonium nitrate blasting agents, whether they used different sensitizer, uh-huh.
Q. I wanted to place up on the screen, if I may, what's been admitted here as Government's Exhibit 674.
Now, we've seen this before. That's our -- how the ammonium nitrate prills are made in a typical plant. And I think you remember that.
A. Uh-huh.
Q. Now, I'm with you all the way through here till we get over to this where I've got my finger. It says "coater."
A. Uh-huh.
Q. And then it says "talc .40 percent" and then "external surfactant."
Now, is the external surfactant different from the talc?
A. Yes.

Paul Rydlund - Cross
Q. What is talc?
A. Talcum powder.
Q. Chemically, what is it?
A. Talc is silicate. It's a -- I'm trying to think of the exact chemical formula now.
I can't. But it basically is a silicate.
Q. All right. So it's a silicon plus something?
A. Uh-huh.
Q. And the external surfactant: Does that differ from manufacturer to manufacturer about what is used?
A. Yes, it does. Yes, it does. The manufacturers of ammonium nitrate may use different surfactive agents.
Q. Now -- if you have mixed your -- if you're using barrels, mix -- if you're mixing in barrels, if one is doing that, this absorption process means you don't have to roll the things on the ground to get it dispersed or anything like that; right?
A. That is correct.
Q. Okay. So that one person could manufacture a -- or could make a device with ammonium nitrate by pouring the bag material and then measuring out the ammonium nitrate and just letting it sit. Correct?
A. Yes.
Q. Now, would Primadet be something that you would use in an improvised explosive device of the kind that was exploded in Oklahoma City?

Paul Rydlund - Cross
MS. WILKINSON: Objection, your Honor. I'm not sure he's familiar with the device. He wasn't in Oklahoma City.
MR. TIGAR: I'll lay a foundation, your Honor, if I may.
THE COURT: All right.
BY MR. TIGAR:

Q. Do you know -- do you have information concerning the kind of device that was exploded in Oklahoma City?
A. No, sir, I do not.
Q. Okay. Well, then, let me put a hypothetical to you.
A. Okay.
Q. If a person were going to park a truck, make a truck bomb, and use 40-gallon plastic barrels and 1500 pounds of ammonium nitrate mixed with the requisite amount of fuel oil and then Tovex as the -- what would we call that, the blasting agent?
A. The high explosive.
Q. The high explosive. Would Primadet be used in that sort of a setup?
A. As a --
Q. For any purpose.
A. Well, a Primadet could serve or would serve as the detonator that detonates the Tovex.
Q. I see.
A. It could serve -- it could serve as that.
Q. But then how -- you said that it moves so fast through

there, the fire, that you'd have a hard time getting away. What else would you have to use?
A. Well, you would have to use -- you would have to use something else as well. You would have to turn around and perhaps attach an electric blasting cap to the Primadet. You might have to attach detonating cord to the Primadet. You would have to use another means -- you would have to use another detonator to detonate the Primadet.
Q. Because otherwise you'd go up with your blast. Right?
A. Yes, sir.
Q. Similarly, if I were going to shoot a ditch on a farm and I were down and it were springtime and it's low-lying ground so I've got my -- I'm going to an ANFO mixture for that, let's assume in some quantities, and that's going to be laying in water -- all right -- Primadet might be useful in that -- right -- because it's waterproof, to hook the charges together?
A. The ANFO mixture may not -- the ANFO mixture may not be very good in water, but the Primadet would be.
Q. Okay. So what would you suggest that I use if I am a farmer and I'm going to shoot a ditch and I've got this water condition -- Primadet would be useful there?
A. Primadet could be used and has been used in trenching or ditching. Yes, it has been.
Q. So -- and -- but to make it safe, then, I'd have to attach a piece of safety fuse to the end -- right -- so that I could

get away?
A. Well, there would be -- there are different means of initiating the Primadet.
Q. Okay. But I understood you to say on direct examination -- I'm not quarreling with you, sir -- that the main use of

I'm not quarreling with you, sir -- that the main use of Primadet in that 60-foot length would be to drop down a 60-foot borehole.
A. That's correct.
Q. But are you now -- are you saying -- and I'm not suggesting this is a contradiction -- this is an additional use for that product: to shoot a trench on a farm under water conditions?
A. Well, Primadet can be used to shoot a ditch or a trench, whether it be at a mine or wherever. I don't think the ditch would be 60 feet deep.
Q. No, no. I understand that. But -- I'm sorry. I've confused --
A. But you mean with that type of initiation system? Is that what you're referring to?
Q. In other words -- I'm sorry.
A. That's correct.
Q. Okay.
A. That's correct. Primadet -- Primadets can be used to shoot trenches. You're right.
Q. And when you say "shoot a trench," you mean it could be used by a farmer up on the surface, not down in a mine, just

out in the field somewhere?
A. It could be used. It could be used to shoot it, and somebody that was knowledgeable -- and somebody that was knowledgeable in those products and capable of using them -- and it would require some -- it would require some other products as well, yes.
Q. Yes, indeed. I understand you can't just do it with Primadet.
A. Well, you need a means to initiate. Right.
Q. Now, when you talked about this Tovex -- let's go back to ANFO now.
A. Uh-huh.
Q. If a person had some barrels of ammonium nitrate, like in that book Hunter, and that fella had his ammonium nitrate -- he had, what, four barrels of it? Is that what he said in his book?
A. I believe so.
Q. Yeah. And they were 40-gallon barrels; right?
A. Uh-huh.
Q. And they were bought at the hardware store; correct?
A. I don't remember if they bought -- I'm sorry. I can't recall if he bought the barrels at the hardware store or not.
Q. And he bought 15 bags of ammonium nitrate; correct?
A. 1500 pounds, I believe. Correct.
Q. Well, what you read out was: "He bought 15 bags of

fertilizer-grade ammonium nitrate. He would have bought more, but 1500 pounds was about as much as he estimated he could manage in one load." Do you remember that?

A. Yes.
Q. But this ammonium nitrate comes in 50-pound bags, doesn't it?
A. Well, today, it's -- I've seen it sold in 80-pound bags and 50-pound bags. That's correct.
Q. 80 and 50.
A. Uh-huh.
Q. So whoever wrote this book didn't know how many pounds there are in ammonium nitrate bags; correct?
A. Well, sir, there were times when ammonium nitrate was sold in 100-pound bags.
Q. Okay.
A. That was not recently. And I can't give you -- I'm sorry I can't gave you the same date, but there were times when it was sold in 100-pound bags.
Q. Do you know when this book was copyrighted?
A. I don't recall, sir.
Q. Yeah. When is the last time you remember seeing 100-pound bag?
A. Well personally, myself handling 100-pound bags?
Q. Yes, sir.
A. Probably 20 years ago.

Q. Yeah. And anyway, that book Hunter is a fiction book, isn't it? Did you read the whole thing?
A. Yes, I did.
Q. It has a certain political slant to it, doesn't it, sir?
A. Yes, it does.
Q. Yeah. The fellow that wrote that is about two bricks short of a load, isn't he?
A. I don't know him. I don't know him. I mean I don't --
Q. You wouldn't agree with his politics, would you, sir?
MS. WILKINSON: Objection, your Honor.
THE COURT: Sustained.
BY MR. TIGAR:
Q. Let's talk about our Tovex. You've got four barrels of ammonium nitrate and you put 50 pounds of Tovex in the middle. Is that the most efficient way to detonate this product?
A. Is it the most efficient way to detonate the product?
Q. Yes, sir.
A. Given that situation -- and I guess I would have to answer your question with the proper amount of Tovex -- and I believe we had -- the cases that we had had been placed adjacent to the barrels. It would provide an efficient detonation. I would suspect if I had primed -- I would expect to receive in that particular case if it was properly mixed and with the -- with the -- and with the cases placed here that at the resulting -- end result detonation velocity would be the same if it -- if we

did it that way or if we placed individual cases of Tovex

within each barrel.
Q. Now, you wrote a master's thesis called "Ignition Time Lag, A Measure of Explosive Energy Release." Correct, sir?
A. Yes, I did. Yes, I did.
Q. And when you wrote that master's thesis, you were very interested in identifying the most efficient way to detonate certain things; right?
A. Yes. Yes, I was.
Q. And the objective when you use ammonium nitrate and a fuel oil mixture is to make sure that you have the best velocity of detonation; is that right?
A. Yes. We -- to make sure that you achieve the highest detonation velocity of the ammonium nitrate -- or of the ANFO. Excuse me.
Q. The ANFO. And when you do that, in order to do that, there are a number of things you have to take into account; correct?
A. Yes.
Q. All right. And one of them is the percentage of the thing that you're going to add to the ammonium nitrate; correct?
A. The percentage -- you mean like the booster?
Q. The percentage of fuel oil, for example.
A. Oh, yes. That's correct. Uh-huh.
Q. Because at a certain point, if I had 10 percent oil by weight, the explosive would not be as efficient; correct?

A. That is correct.
Q. Okay. And what would you have, then? You'd have unexploded particles, or what would be the result if it was 10 percent?
A. Well, if it was 10 percent -- and again, it would depend upon the location of the booster and the -- and the size of the charge and the confinement; so there would be -- there would be other factors involved as well. But there could be, if you had a very, very small charge like a size of this cup -- okay --
Q. Yes, sir.
A. And it had 10 percent fuel oil in it -- okay -- in the ammonium nitrate and there was very little confinement, it was just in the cup, you know, and you turned around and you set half a stick of dynamite or something close to it, conceivably you could have some prills off to the side because you have a very inefficient -- a very inefficient product.
Q. Now, what is "ignition time lag"?
A. Well, "ignition time lag" was a phrase I coined in my master's thesis, and it referred to the time lag between the time the ammonium nitrate and the ANFO mixture was initiated and when it reached its maximum or steady state detonation velocity.
Q. All right. And is there an ideal time lag there?
A. Well, the ideal time lag would be -- the ideal time lag -- would be immediate.

Q. Would be zero?
A. That's correct.
Q. That is to say, if we could disregard the laws of physics and chemistry and we had a quantity of ammonium nitrate and fuel oil in a container, we'd like all of it to oxidize at once or explode at once; right?
A. To reach its maximum efficiency all at once. That's correct.
Q. Yes, sir. And if I'm using the wrong terms, please correct me.
A. No, I'm not trying to be --
Q. But we can't do that; right. That's impossible?
A. That's pretty close to impossible, yes.
Q. And so there are different ways that the blaster can maximize efficiency in that way by reducing the time lag, this ignition time lag as much as possible; correct?
A. That's correct.
Q. Okay. And one of those ways is with the -- has to do with the efficiency of whatever initiating charge you're using. Right?
A. That's correct.
Q. And is another way the proximity of the initiating charge to the prills that have absorbed the fuel oil or whatever hydrocarbon you're using?
A. Yes.

Q. Okay. So proximity is a factor in reducing this ignition lag time. Is that fair to say?
A. Yes. And again, in the proper context, this was all done within blast holes.
Q. I understand.
A. Placing it in blast holes as well. That's correct.
Q. When we speak of these things, we necessarily have, what -- there are 25 factors that have to do with whether this thing is going to succeed or not. Correct?
A. Well, there is a number of them. I don't know if it's 25.
Q. Well, there are a large number?
A. Yes, sir.
Q. And one of them, as you've said, is containment?
A. One of them is containment.
Q. And by identifying proximity as one, we don't mean to exclude the others; correct?
A. (Witness nods head.)
Q. Okay. Now, I want to put up, if I may, what has been received as Government's Exhibit for demonstrative purposes No. 691. Now, that is your -- did you make the diagram, sir, or --
A. No.
Q. It was made at your direction?
A. The diagram was -- the diagram was shown to me, and I agreed to discuss it, yes.

Paul Rydlund - Cross
Q. Okay. I'm not trying to --
A. I understand. No. That's correct.
Q. -- argue with you about it.
A. Uh-huh.
Q. Now, right at the middle here, we're talking about a shock front. You say that's supersonic; and I believe you said on direct 13,000 miles an hour, but you meant feet per second.
A. No, miles per hour.
Q. 13,000 miles per hour?
A. Right.
Q. What is that in feet per second?
A. Well, I'd have to go back and calculate that.
Q. 60 miles an hour is 88 feet per second; correct?
A. Well -- okay. I don't have my --
Q. We don't know?
A. Anyway, fine. 13,000 miles per hour is what I quoted, yes.
Q. And what is that in feet per second so that we're consistent here? Aren't velocities of detonation usually measured in feet per second?
A. But that is not the detonation velocity.
Q. I understand. But I want to be consistent. I want to see if we can get a number. If we can't, it's okay.
A. Okay. So we're at 13,000 miles per hour.
Q. Would you accept about 10,000 feet per second? No, the other direction. So about 20,000 feet per second?

Paul Rydlund - Cross
A. No, it would be much less.
Q. A little less?
A. Let's see, we've got thousand and feet, so we've got 5280 divided by 30 -- 60 times 60 is 3600, so 52 divided by 36 times
13 is -- yeah, I guess -- whatever it comes out.
Q. I'm sorry I asked.
Tell you what: I'm go on to something else. Excuse me. I'm -- Very fast. Would you agree with that? Moving very fast. Okay.
A. Now, but not as fast as the velocity of detonation.
Q. Okay. Not as fast as the velocity of detonation. That is to say, as the pressure wave moves out, the speed tends to reduce. Correct?
A. No, as it moves out, it's moving like a shock wave moves in air, the speed of a shock wave moves in air.
Q. In air, you say, "initiation inside thermal effect." That's the part I wanted you to look at where this very red part is.
A. Uh-huh.
Q. What's the temperature in there?
A. The temperature at the point in the chemical reaction is 6,000 -- I'm sorry.
Q. Let's take it a moment at a time. Let's get a set of assumptions here. Have you worked with mixtures of ammonium

nitrate and nitromethane?

Paul Rydlund - Cross
A. I've done -- I've done a little work with it, yes. I've done some years ago.
Q. And is the temperature at the moment of detonation of a nitromethane device going to be about the -- nitromethane -- nitromethane/ammonium nitrate device about the same as an ANFO device?
A. I would -- I can't answer that question. I can't answer that question completely because I don't know the exact temperature, so I could only offer an opinion. I'm sorry.
Q. All right. Well, then let's stick -- An ANFO device you could tell us without much trouble?
A. I think what I had come back and said was in the chemical reaction zone where we were talking about, we're about 6,000 degrees Fahrenheit.
Q. 6,000 degrees Fahrenheit. So that if someone had a 40-gallon barrel of ammonium nitrate mixed with 6 percent fuel oil and initiated it with the initiating charge stuck into the mixture -- all right -- what would be the temperature experienced by the barrel, plastic barrel?
A. Again, with the diameter of the plastic barrel -- I would have to calculate it. I don't -- I can't tell you right now what that temperature would be. All I can tell you is that right at the point of detonation it would be that temperature. Obviously --
Q. And is there a formula that we could use that we could look

Paul Rydlund - Cross
up to see what the temperature would be 2, 3, 4, 5 feet away from the center point of ignition?
A. There would be a formula, but -- there would be a formula. There would be some numbers, but I don't have that.
Q. I'm not asking you to speculate. But the point is, we could find somebody; we could look it up.
A. Yes.
MR. TIGAR: Okay. Now, we had picture up here, if I may show that, Mrs. Hasfjord.
I'm sorry. 685. The clerk is helping me.
Oh, good.
BY MR. TIGAR:
Q. This is Government's Exhibit 685 -- is an electric blasting cap; and then you had another one that was a nonelectric. Is that the sort of thing that is regulated differently depending on what state you're in? Blasting caps?
A. That comes under the ATF regulations, and there are some state regulations that speak to, you know, how you can handle the commerce of it, yes.
Q. Let me see, here. Now, sir, finally I want to turn to this question of how you handle and store this material. Right?
A. Ammonium nitrate?
Q. Yes, sir. Ammonium nitrate. Now, we looked at the box

Q. Yes, sir. Ammonium nitrate. Now, we looked at the bag earlier, and are there regulations that you all follow in your business as to how to deal with this material?

A. Ammonium nitrate, or ammonium nitrate fuel oil?
Q. Ammonium nitrate.
A. Ammonium nitrate? Are there regulations that we have?
Q. Yes, sir.
A. With respect to safety?
Q. Yes, sir.
A. I suspect that's what we're coming to.
Q. Yes, sir.
A. And how we would store it?
Q. As to how you would store it and how personnel are instructed to treat it.
A. Okay. All right. Yes. It can be stored in bulk. It can be stored in bulk bins. Basically, it is transported by rail cars and then generally put into bulk bins or put into trucks and then put into bulk bins.

The material, again, is -- for purposes of the bins and where it's stored is we want to try to keep fire away from it, so that brush and everything is cleaned away, no trash around it. Things like that. Those are important.
Q. Now, do you have people -- do you ventilate the areas in which it's stored?
A. Well, let me try to give you some examples as to where we're at because -- in using the term "ventilate" -- excuse me. In a mine, for instance, okay, we would store ammonium nitrate perhaps in just a great big 60-ton overhead bin that's

completely enclosed. All right? It's completely enclosed and maybe sits 12, 14 feet off the ground and holds 60 tons. Okay?

A lot of times it's stored in a rail car, and it's not
even used to make ANFO until they take it out of a rail car; and of course -- it's a hopper car which is completely enclosed to keep moisture away from it. Those are cases --

If you are using it in a fixed-plant location -- if you were going to try to make, for instance, a water gel like you discussed or you're going to try to make ANFO in a fixed-plant location, then you would look -- it's the people working in that fixed-plant location, and you would obviously try to have some air movement, ventilation, fans, or whatever it is in that area as well. But the main hazard with ammonium nitrate is fire and to try to keep flame away from it.
Q. Now, in your material safety data at El Dorado, do you have a provision about respiratory protection?
A. Yes, we do.
Q. And what is the purpose of your provision on respiratory protection?
A. The purpose on the respiratory protection is to try to get

A. The purpose of the respiratory protection is to try to get fine -- is to try to prevent very fine airborne particles of ammonium nitrate from getting into the system, into -- into your -- being not ingested but to get into --
Q. Into your respiratory system?
A. Respiratory system. Right. Uh-huh.

Paul Rydlund - Cross
Q. And the reason you have those is that that is a real-life possibility; that is to say, that could happen. Correct?
A. The purpose of it is that there are fine airborne particles in there you want to be able to -- you don't want them -- to get them in. Now, that's if there are fine airborne particles in there which we might call dust or pieces -- or very fine particles of ammonium nitrate that are suspended in air.
Prills aren't.
Q. Now -- and I said "finally," but I didn't mean it. This really is final. Okay?
A. Okay.
Q. If I wanted to test the hydroscopic properties of ammonium nitrate, would you agree with me that it would be a proper experiment to do this to set up a bell jar with a sealed -- sealed bell jar with 98 percent relative humidity regulated in there and then put a small sample on a watch glass and time how long it took to puddle?
A. That could be a test for it. I don't know how much moisture is in the bell jar, how big it is, and that's --
Q. You know what a bell jar is?
A. I know what a bell jar is; and if you were trying to develop a test for it, that could be a test. And yeah, you would have -- if you knew, you know, the size of the nitrate and how much -- you'd have to know the grains of moisture in the bell jar.

Paul Rydlund - Cross
Q. Which you would know by knowing the percentage of humidity, the temperature, and so forth and so on.
A. The temperature. You could calculate it, yes.
Q. You also need to know the temperature?
A. Yes. Uh-huh.
MR. TIGAR: Would your Honor indulge me for a moment?
THE COURT: Yes.
MR. TIGAR: Mr. Rydlund, thank you very much. I really appreciate your answering our questions.
THE WITNESS: Sure.
THE COURT: Do you have some redirect?
MS. WILKINSON: Just briefly, your Honor.
REDIRECT EXAMINATION
BY MS. WILKINSON:
Q. Mr. Rydlund, do you recall being asked by defense counsel about the passage from the Hunter that discusses placing the barrels of ammonium nitrate and fuel oil around the cases of Tovex? Do you remember --

A. Yes.
Q. -- Mr. Tigar asked you about that? And he asked you was that the most efficient way to detonate or build a bomb; is that right?
A. Yes.
Q. Let me ask you: Is it efficient enough?
A. Yes.

Q. And what do you mean by that?
A. I mean that it's efficient enough that we can detonate the ammonium nitrate at the -- at the maximum velocity that could be achieved in that particular barrel with that particular amount of fuel oil.
Q. And if it was detonated properly, would you expect the ammonium nitrate and the fuel oil to be consumed in the explosion?
A. Yes, I would.
Q. And is ANFO used in the commercial industry because it is an efficient product?
A. Yes, it is.
Q. And in your experience when you've done testing and you've done your field work, are ammonium nitrate prills left behind after an explosive device is detonated properly?
A. No.
Q. Now, you were also asked about that bag, the brown bag that -- ICI bag that holds the ammonium nitrate prills.
A. Yes.
Q. Do you recall that? And you were asked -- I don't remember what it was called but about the white residue that was on there, the "striplings," I think they referred to.
A. Uh-huh.
Q. If you were storing ammonium nitrate in the sealed bags over several months in a storage shed, would you expect to see

any of those prills on the outside of the bag?
A. On the outside of the bag? No.
Q. Would you expect those bags to leave any ammonium nitrate residue if you had stored them closed and then you removed them from the storage shed?
A. No.
Q. You were also asked about the efficiency of a charge if you used a very small charge. I think you qualified it and said if you use more fuel than recommended -- used 10 percent, I think you said, or Mr. Tigar asked you -- and whether it would or wouldn't detonate efficiently. Do you recall that?
A. Uh-huh.
Q. If you have a very large main charge -- that is, an ammonium nitrate charge of 4 to 6,000 pounds -- what would be the effect if you had 10 percent fuel instead of 6 percent fuel?

A. If -- on a charge of that size?
Q. Of that size.
A. On the configuration that we discussed before on that?
Q. Yes.
A. Then if we had 10 percent -- if we had 10 percent fuel oil,
then I would expect to see prills remain. I would expect it to be a very inefficient explosion.
Q. If you had 10 percent fuel?
A. Yes.

Paul Rydlund - Redirect
Q. What if you changed the booster?
A. Even if you changed the booster, it would still -- it would still be an inefficient explosion.
Q. And why is that?
A. Because it's -- because there is too much fuel for the ammonium nitrate.
Q. Now, what about the question about the -- if barrels were exposed to -- I think that's what you were being asked about, the barrels that held ammonium nitrate, if they were exposed to the seat of the blast and the actual explosion whether any portions of those barrels would remain.
MR. TIGAR: Excuse me, your Honor. I didn't ask that. Improper redirect.
MS. WILKINSON: I'm sorry, your Honor. I'll rephrase it.
THE COURT: All right.
BY MS. WILKINSON:
Q. Do you recall being asked about the effect of the explosion and the heat and the gases at the center of the explosion on plastic?
A. Yes.
Q. Okay. Now, in an explosion, if barrels were used to contain an ammonium nitrate and fuel oil device, would or could the force of the blast blow the barrel -- the barrel apart before it was consumed by the actual explosion?

Paul Rydlund - Redirect
A. No, not in an inefficient explosion.
Q. Not what?
A. No, not in an efficient -- not in an efficient explosion.
Q. And in an improvised explosive device, are there times when it does not operate totally efficiently? An improvised explosive device? Would you expect that there could be times when it would not operate totally efficiently?
A. Okay. And the question -- I'm sorry -- is?
Q. Would you expect that at times an improvised device -- not a manufactured product --
A. An improvised device if it was put together incorrectly or inefficiently?
Q. Or inefficiently, like you said.
A. Then the answer to the question, yes, I would expect

A. Then the answer to the question, yes, I would expect.
Q. So you could find remains of the barrel or other items?
A. Yes. And if you would find the remains of the ammonium nitrate, I would expect you would find the remains of the barrel.
Q. Thank you very much.
One other question: If you had that same device that operated -- I don't know, would you call it "partially efficiently"? I don't know what the term is. It detonated, let's say, but it wasn't optimum efficiency. How about that?
A. Usually they say non-ideal or partially, yes.
Q. Let's say it left behind some ammonium nitrate prills. If

those prills were exposed to a heavy rain, what would happen?
A. If they were exposed to heavy rain, they would dissolve.
MS. WILKINSON: No further questions.
THE COURT: Mr. Tigar.
MR. TIGAR: Just on that one --

RECROSS-EXAMINATION

BY MR. TIGAR:
Q. I promised you wouldn't see me again, but here I am.
If an improvised explosive device was made inefficiently -- that was the question you were asked -- you said that the container -- a container such as a plastic barrel might survive in some sense. Is that correct?
A. That's correct.
Q. But if the device were efficient -- i.e., constructed according to the standards that you talked about first -- then you would not expect the container to survive?
A. That is correct.
MR. TIGAR: All right. Thank you very much, sir.
THE COURT: Excusing the witness now?
MS. WILKINSON: Yes, your Honor.
MR. TIGAR: Yes, your Honor.
Thank you, sir.
THE COURT: You're excused now.
THE WITNESS: Thank you.
THE COURT: You can leave. Thank you.
Next witness.
MR. MACKEY: Your Honor, we would call Tim Donahue.
THE COURT: All right. Mr. Donahue.
THE COURTROOM DEPUTY: Raise your right hand, please.
(Timothy Donahue affirmed.)
THE COURTROOM DEPUTY: Would you have a seat, please.
Would you state your full name for the record and spell your last name.
THE WITNESS: Timothy Patrick Donahue, D-O-N-A-H-U-E.
THE COURTROOM DEPUTY: Thank you.
THE COURT: Mr. Mackey.
MR. MACKEY: Thank you, your Honor.

DIRECT EXAMINATION

BY MR. MACKEY:
Q. Mr. Donahue, good afternoon.
A. Good afternoon.

Q. Mr. Donahue, would you start by telling the jury a little bit about yourself. How old are you?
A. I'm 39.
Q. And are you married?
A. Yes.
Q. To whom?
A. To Lisa Donahue.
Q. And how long?
A. 16 years.

Q. You knew I was going to ask you that question beforehand, didn't you?
A. Pretty well, yeah.
Q. How about children?
A. Got a daughter and a son.
Q. Age?
A. Daughter is 14, and my boy's 9.
Q. And where do you live, Mr. Donahue?
A. I live about 15 miles northeast of Marion, Kansas.
Q. And where is Marion, Kansas?
A. East central Kansas.
Q. Born and raised in that area?
A. Yes.
Q. And back in 1964, did your dad buy a single section of ranch land in central Kansas?
A. A quarter section, yes.
Q. A quarter section. How many acres?
A. 160.
Q. And today, how large is the Donahue Ranch?
A. It's about 15,000.
Q. And do you spend your time working on that ranch?
A. Yes.
Q. Who helps in the operation of the Donahue Ranch?
A. Well, it's a partnership between my dad and my brother and myself; and my brother has a man that works for him, and I have

a man that works for me.
Q. Essentially your brother, Dudley, and yourself with each of you having a hired hand?
A. Yes.
Q. And give the jury an overview of the Donahue Ranch operations.
A. Well, we're primarily a cattle/cow/calf operation. We run about a thousand cows, back our own calves through the wintertime and do some farming, usually around 8-, 900 acres of dry wheat and some silage feed, a lot of alfalfa, hay, feed our cows.
Q. So you're a rancher?
A. Yes.
Q. And you farm only to ranch?

A. Yes.
Q. Mr. Donahue, does your family have any businesses other than the operation of the ranch?
A. Well, my dad is in the trailer-manufacturing business, and my parents also own and operate a bed and breakfast.
Q. I want to turn your attention, Mr. Donahue, to central Kansas. A map of it. You should find it in your folder. Exhibit 2045. 2045.
A. Okay.
Q. And having spent your life in central Kansas, are you familiar with the location of the cities that are shown on that

exhibit?
A. Yes.
Q. Have you been to all of those places?
A. Yes.
MR. MACKEY: Your Honor, I'd like to move to admit Government's Exhibit 2045.
MR. TIGAR: No objection, your Honor.
THE COURT: 2045 is received, may be displayed.
MR. MACKEY: Thank you.
Computer. Yes. Thanks.
BY MR. MACKEY:
Q. All right. Mr. Donahue, let's start on the east side of the state. And just for the record, do you see the city of Topeka, Kansas, noted there?
A. Yes.
Q. And what interstate runs through Topeka?
A. 70.
Q. And if you travel west on I-70 out of Topeka, do you reach Junction City?
A. Yes.
Q. And do you see that on that exhibit?
A. Yes.
Q. Northeast of Junction City: What city is noted there on the exhibit?
A. Be Manhattan.

Q. And what highway intersects I-70 at Junction City running north/south?
A. 77.
Q. And if you would turn left, go south on 77, would you pass a lake that's shown on that exhibit?
A. Yes.
Q. And what's the name of that lake?
A. Geary Lake.
Q. And continuing south on 77 past Geary Lake, do you come to the town of Herington, Kansas?
A. Yes.
Q. Is that accurately shown on the exhibit before you?
A. Yes.

A. Yes.
Q. And traveling on down 77, do you eventually intersect a highway of 150 and 56?
A. Yes.
Q. And what town is closest to the intersection of those highways?
A. It's Marion.
Q. Are we getting close to your neighborhood?
A. Yes.
Q. All right. Let's take a turn west on 56 and head over to the next town on the map. What's shown there?
A. McPherson.
Q. All right. If you were to head back up north from

McPherson, due north, what city would you find on the map?
A. Salina.
Q. And bottoming out this exhibit, what's the southernmost city in Kansas shown on this exhibit?
A. Wichita.
Q. Back up to Herington, Highway 56 takes a jog, I take it.
A. Uh-huh.
Q. Runs north for a while and then returns east/west?
A. Yes.
Q. If you take 56 east out of Herington, what's the next town you come to?
A. Council Grove.
Q. And you have over the years been to Council Grove and Herington, Marion, and the other cities on this exhibit?
A. Yes.
Q. Mr. Donahue, I've got a mileage chart here. Let me give you some numbers and see, based on your experience, if they represent accurate distances between those cities.
Is it approximately 37 miles between Marion and McPherson?
A. Yes.
Q. 82 miles between McPherson and Council Grove?
A. Yes.
Q. 58 miles between McPherson and Herington?
A. Yes.

Q. About 25 miles from Herington north to Junction City?
A. Yes.
Q. About 24 miles from Herington to Marion?
A. Yes.
Q. And about 24 miles from Herington to Council Grove?
A. Yes.
Q. I wonder if you'll take your light pen up there, Mr. Donahue, and give us a little orientation about where the Donahue Ranch is as shown on this exhibit.
A. This?
Q. Yes, please.

Q. Yes, please.
A. Right in -- right in that area.
Q. And the area that Dudley Donahue farms: In what direction from your ranch is it?
A. That would be west.
Q. And if you could mark that, please.
A. Right in that area.
Q. And do you ranch and farm an area known to you as Clover Cliff?
A. Yes.
Q. Could you mark that area or that ranch area on that exhibit?
A. In that area.
Q. The 15,000 acres that your family owns and operates: How many different counties does it sit in?

A. Two.
Q. And those counties are, by name?
A. Marion and Chase County.
Q. You told the jury that the way the day-to-day operation works is you have a hired hand and your brother has one?
A. Yes.
Q. As it relates to your hired hand over the years and specifically in 1994, tell the jury what you paid your hired hand.
A. He was getting $300 a week. He was provided a house, utilities, half a beef every six months, and then we was paying $200 on his family insurance.
Q. And what does that compute bottom line in terms of an annual salary?
A. I would gross it about 23,000 a year with his benefits.
Q. Mr. Donahue, I want to show you a couple of aerial photos of your ranch. Look in your folder for Exhibits 40 and 41.
A. Okay.
Q. You've seen those before?
A. Yes.
Q. And are they fair and accurate depictions of at least part of the Donahue Ranch, at least the parts that show the location of your home and the hired ranch -- or hired hand's ranch home?
A. Yes.
MR. MACKEY: Your Honor, I'd move to admit

Government's Exhibits 40 and 41.
MR. TIGAR: No objection, your Honor.
THE COURT: Received.
BY MR. MACKEY:
Q. Mr. Donahue, let me ask you to click your pen up there and we'll clear the screen and show these photographs.
This looks like flat Kansas; right?
A. Yes.
Q. All right. But there is a line running up and down the

length of the photo. You recognize what that road is?
A. Yes.
Q. And what is that road?
A. County road connecting our ranch with hired man's house.
Q. Get us oriented. Where is your home on Exhibit 40?
A. It's at the very top of the picture.
Q. And where is the hired hand's ranch home?
A. Very bottom.
Q. All right. Let's show you Government's Exhibit 42. And is that the same -- I'm sorry. 41. My error.
Thank you.
Is that the same north/south road that you identified earlier, just from the opposite direction?
A. Yes.
Q. So is your home at the bottom and the ranch hand's home is toward the top of the photo?

A. That's correct.
Q. Let's show you, please, Government's Exhibits 42 and 43.
A. Okay.
Q. And do you recognize what's shown in each of those photographs?
A. That's the house we provide for our hired man.
Q. And each of the two photographs, 42 and 43. Is that correct?
A. Yes, uh-huh.
MR. MACKEY: Your Honor, we'd move to admit those two exhibits.
MR. TIGAR: May I ask one question, your Honor?
THE COURT: Yes, you may.
VOIR DIRE EXAMINATION
BY MR. TIGAR:
Q. Good afternoon, Mr. Donahue. I'm Michael Tigar. I represent Terry Nichols.
A. Okay.
Q. Just -- on that Photograph No. 42 you have there --
A. Yes.
Q. -- you have there is a blue pickup there?
A. Uh-huh.
Q. That's not Mr. Nichols' pickup, is it?
A. No.
Q. That just happened to be there at the time this was taken?

A. Yes.
MR. TIGAR: Thank you, your Honor. We have no objection.
THE COURT: All right. They're received. 42 and 43.
DIRECT EXAMINATION CONTINUED
BY MR. MACKEY:
Q. Mr. Donahue, the jury is now looking at Photograph No. 42.

Tell them, please, what's shown.
A. That's the house that we provide for our hired man.
Q. And the road that appears in the foreground of that photograph: Is that the same one we were looking at from high in the air?
A. Yes.
MR. MACKEY: Show the jury, please, Exhibit 43.
BY MR. MACKEY:
Q. Is that simply a closer view of that same residence?
A. Yes.
Q. Mr. Donahue, what was the address if you lived at that residence -- what was the address that you would use?
A. It was Route 3, Box 83, Marion.
Q. And take a look, please, at an exhibit marked No. 88 in your folder.
A. Okay.
Q. Do you see a line for address on that document?
A. Yes.

Q. And do you recognize that address?
A. Yes.
Q. And what address is on that document?
A. That's the address to the hired hand's house.
Q. Is that the same address, Route 3, Box 83, Marion?
A. That's correct.
Q. Could you tell the jury who was living at that home at that address in September of 1994?
A. Terry Nichols.
Q. Do you know a person by the name of Shawn Rivers?
A. No.
Q. To your knowledge, has anyone by the name of Shawn Rivers ever lived at your hired hand's ranch home?
A. Not to my knowledge, no.
Q. Mr. Donahue, do you know Terry Nichols?
A. Yes.
Q. And when did you first meet him?
A. March of '94.
Q. How did you come to know him?
A. I was running an ad for a hired man, and he responded to the ad.
Q. Did you eventually hire Mr. Nichols as your hired hand?
A. Yes.
Q. How long did he work for you?
A. Just a little over six months.

Q. And do you recall the date that he last worked for you?
A. Yes.
Q. What is that date?
A. That was September 30 of '94.
Q. Mr. Donahue, let me ask you: If Mr. Nichols were in the courtroom, based on having worked with you for six months,

courtroom, based on having worked with you for six months, would you be able to identify him?
A. Yes.
Q. Would you do so at this time?
A. Sitting at the table there, the blue jacket on.
MR. TIGAR: The identification is conceded, your Honor.
THE COURT: All right. Thank you.
MR. MACKEY: Thanks.
BY MR. MACKEY:
Q. Mr. Donahue, let's take us back in time to when you first met Terry Nichols and talked to him about coming to work for you. Could you describe where that conversation took place and what was said.
A. It would have been at the ranch yard where me and my folks live.
Q. And tell us what happened in that conversation.
A. Well, he come out for a personal interview, and we discussed his experiences and what the job entailed and just got to know each other a little bit.

Q. Did Mr. Nichols tell you at that time where he was living?
A. He was staying in a motel in Junction City.
Q. Did he tell you where he was from?
A. Yes. From Michigan.
Q. Did he give you any details about his employment background?
A. He had been farming with his brother in Michigan; and they had some personal differences, and he needed to go find a job somewhere else.
Q. Did he tell you how he had come to select Kansas?
A. He told me he had been through the area before and liked the country and wanted to move down here and eventually someday start a ranch, I guess.
Q. What did you learn from Mr. Nichols about his marital situation?
A. That he was married and had a small child. They'd be coming shortly.
Q. Did you discuss with Mr. Nichols what you would pay him if he came to work for you?
A. Yes.
Q. Did you tell him what you told this jury?
A. Yes.
Q. In terms of the compensation?
A. Yes.
Q. And did you tell Mr. Nichols what would be expected of him

in terms of the day-to-day work?
A. Yes.
Q. All right. What did you tell him?
A. Just that at the beginning of his employment it would be a

lot of livestock work, feeding cattle, taking care of cattle. Then after about, oh, first of May, we go more to farming operations. We have all of our cattle out on pasture, and it's more strictly grain farming and explained that to him.
Q. Did you tell him how many days per week you would expect he'd be working?
A. Yeah. It was between five-and-a-half- and six-day workweek; and I don't know if I went into average on hours, but we generally figure about -- averaging about 60 hours a week.
Q. Did Mr. Nichols make any statement to you on this first occasion about his willingness to make a commitment?
A. Oh, yeah. He was -- he was interested in coming to work and said he'd give me a commitment of working for me for two years.
Q. What did you say in response to that?
A. I thought that was kind of tough to live up to that, so I just requested that he give me a month's notice when he quit. That would help me out and if plans changed. And whether he'd be able to keep that two-year commitment was doubtful to me, so I just requested that he give me a month's notice when he terminated.

Timothy Donahue - Direct
Q. Mr. Donahue, did you hire Mr. Nichols on the spot?
A. No.
Q. That is, on that first day?
A. No.
Q. What did you do?
A. We just agreed to get together in a few days and each of us think it over. And that's what we did.
Q. And did you eventually then decide to hire Mr. Nichols?
A. Yes.
Q. As your hired hand?
A. Yes.
Q. And in the course of the six months or so that followed thereafter, did you and Mr. Nichols have much social contact?
A. Socially, no.
Q. How often was he in your home?
A. Oh, once for Sunday lunch and then maybe a time or two to use the telephone. That would have been the only times that I remember.
Q. And were you ever invited to Mr. Nichols' home socially?
A. No.
Q. Let's spend a little more time, Mr. Donahue, talking about the nature of the work during that period between March and September of 1994. You told the jury that in the early spring you had spent a lot of time attending to the cattle?
A. Yes, that's correct.

Timothy Donahue - Direct
Q. And I assume you put in a crop of corn sometime in April?
A. Yes.

Q. How would the work change as the month of May rolled around?
A. Well, early May, first couple weeks in May, we'd be pretty busy moving all the cows and calves to grass, to pasture. And after that, after the cattle are on grass, then they're pretty well self-sufficient; so we give more to planting milo, feed, things like that, hay. We go to more a farming operation.
Q. So by the summer, the cattle are out to pasture and you're spending more of your day-to-day time in the farming operations?
A. Yes.
Q. Could you tell the jury how Mr. Nichols would start each workday during the time he worked for you?
A. He would drive his pickup up to the ranch yard and start there at 7:30 in the morning.
Q. And that's again the 2-mile road that we saw earlier in the aerial photographs?
A. Yes.
Q. And approximately what time each morning would he arrive?
A. About 7:30.
Q. And what would happen at the start of each day up at your house?
A. Well, we'd get together and kind of go over the day's

outline of what we was going to do, and then we'd proceed to go do that.
Q. Some of the days, did you work in the same field together?
A. Yes.
Q. And other days in entirely different parts of this 15,000-acre operation?
A. Yes.
Q. Tell us a little bit about the lunch breaks. How was that handled?
A. Well, generally we'd each go to our own house and eat lunch. On occasions we'd eat together. On occasion we'd just eat while we was operating the tractor at times. But I'd say majority of the time for sure we'd go to our own houses and eat dinner.
Q. And I take it there was no set time when work would stop and the lunch would start?
A. No, not really. We'd shoot for noon, but that -- that varied quite a bit. Just depended on what we was doing, time schedule.
Q. So at any point in his employment between late morning and early afternoon, Mr. Nichols could well have been at his home?
A. It's possible, yes.
MR. TIGAR: Object to the leading, your Honor.
THE COURT: Sustained.
BY MR. MACKEY:

Q. Mr. Donahue, let me ask you a few questions about

Q. Mr. Donahue, let me ask you a few questions about fertilizer and the use of fertilizer at your operation. Tell the jury what you use or have over the years at least till 1994.
A. Well, most of our fertilizer is commercially applied.
Q. Which means?
A. We have the co-op -- the local co-op come and spread it on our fields for us with their own truck. We don't handle it any. The only time we handle any is through our planters. It's a blended fertilizer we incorporate at planting time with milo and corn.
Q. In all the years of your operation, the farming end of your operations, have you ever used ammonium nitrate?
A. No.
Q. Do you know any other farmers in central Kansas who do as a routine matter?
A. No.
Q. Which co-op do you frequent?
A. It's Tampa Co-op Association.
Q. Have you ever been a member of the Mid-Kansas Co-op?
A. No.
Q. Have you ever done business at Mid-Kansas Co-op in McPherson?
A. No.
Q. Have you at any time sent Terry Nichols to Mid-Kansas,

McPherson, Co-op in the course of his employment?
A. No.
Q. Mr. Donahue, in operating this farm, do you use trailers of any type or size?
A. Yes.
Q. Describe that for the jury, please.
A. All of the different types? I mean, we use livestock trailers, trailers to haul grain with, flatbed trailers to haul hay with, utility trailers to hold salt and four-wheelers, that kind of thing, with.
Q. How many utility trailers did you have in September and October of 1994?
A. Three.
Q. And what sizes were they?
A. There was one smaller one that's a 4-by-8, and then there is two larger ones that are classified as 8-by-12's.
Q. Take a look, please, at Government's Exhibits 2071 through 2074. Should be four photographs.
A. Okay.
Q. Do you recognize what's common in each of those pictures?
A. Yes. It's our utility trailers.
Q. And are those photographs of the small utility trailer that you had on your farm in September and October of 1994?
A. Yes.
MR. MACKEY: Your Honor, I would move to admit those

four photographs, 2071 through 2074.
THE COURT: Are these all the same trailer, Mr. Donahue?
THE WITNESS: Yes.
MR. TIGAR: No objection, your Honor.
THE COURT: All right. They're received.
MR. MACKEY: May we publish, please.
THE COURT: Yes.
BY MR. MACKEY:
Q. Mr. Donahue, we're going to show the jury those four photographs. Would you just tell them what they're looking at.
A. It's three little utility trailers that we use on our ranch operation.
Q. Take a look at the one that's on the screen right now, 2071.
A. Okay.
Q. What size bed does that small utility trailer have?
A. That's a 4-foot-by-8-foot.
Q. Let's take a look at 2072. Is that another angle of the same small utility trailer?
A. Yes.
Q. And 2073?
A. Yes.
Q. This is a photo taken of the same trailer from the opposite side?

A. Yes.
Q. And how about 2074?
A. Same trailer.
Q. You mentioned you had some larger utility trailers. How is the small one, the 4-by-8, different from the other two larger ones?
A. The smaller one has white-spoked wheels on it. It's a newer version of the trailer that they built. It's got a metal fold-down end gate on it and then that rail that goes around the bed.
Q. And the word "Donahue" appears on the metal tailgate --
A. Yes.
Q. -- on the small trailer.
Have you used that small trailer over the years?
A. Oh, yes.
Q. And you mentioned earlier about hauling salt with it.
A. Yes.
Q. Tell the jury when and what you've done with that.
A. Well, occasionally I go to the co-op and get a pallet of salt, and they set it on there and I haul it out to the pastures to put out for the livestock to lick.
Q. And what's the weight of the pallet of salt that you routinely buy and load onto that utility trailer?
A. It's 2,000 pounds.
Q. Is that 1 ton, then?

A. Yes.
Q. And I take it you then travel on the highway with that load from the co-op out to the pasture?
A. Yes.
Q. In September and October of 1994, where more often than not was the small utility trailer?
A. Most of the time it was down at the Clover Cliff Ranch.
Q. And that's the ranch some distance east of your home?
A. Yes.
Q. When it was there, was it under lock and key?
A. No.
Q. Was it secured in any fashion?
A. No.
Q. Where was it usually parked?
A. It was usually parked down along a feed bunk there not too far from the caretaker's house.
Q. In September and October of '94, was anyone living at the Clover Cliff Ranch?
A. No.
Q. The caretaker that you mentioned: Did you have one on site living there?
A. No. He was traveling -- he'd get there in the morning and leave in the evening.
Q. When was payday at the Donahue Ranch?
A. Every other Friday.

Q. And was your routine to pay Mr. Nichols then every other Friday?
A. Yes.
Q. And what was his routine in terms of having that paycheck cashed?
A. Most often he would take it to the bank sometime during that day and get cashed.
Q. Do you know where Mr. Nichols banked in the time period he worked for you?
A. Most of the time in Marion.
Q. Let me show you Government's Exhibit 46A.
A. Okay.
Q. And do you recognize what that is?
A. It's a map of my area where we live and ranch.
Q. Is it a section map that shows the location both of your residence and the town of Marion, Kansas?
A. Yes.
MR. MACKEY: Your Honor, I move to admit Government's Exhibit 46A.
MR. TIGAR: No objection, your Honor.
THE COURT: Received. 46A.
BY MR. MACKEY:
Q. Mr. Donahue, with the pen, just get the jury grounded as to where Mr. Nichols' house was in September and October of 1994 on this map.

on this map.

A. Okay. Right there.
Q. Could you draw a big circle, then, around the town of Marion, Kansas.
And over the years, have you become familiar with the location of a rock quarry near Marion, Kansas?
A. Yes.
Q. Would you circle the location of the rock quarry on that same exhibit.
MR. MACKEY: Your Honor, may we ask Kathi to print that out for the record?
THE COURT: We'll ask her to try.
MR. MACKEY: Don't clear your pen yet, Mr. Donahue.
THE WITNESS: Oh, I did. I already did.
BY MR. MACKEY:
Q. We lost the rock quarry. Could you put that back up, please.
A. Okay.
Q. Thanks.
Mr. Donahue, Terry Nichols eventually left your employment.
A. Yes.
Q. And do you remember having conversation with him when he told you he intended to do so?
A. Yes.
Q. Do you remember where that conversation took place?

A. I believe it was in the ranch yard.
Q. Do you remember what date?
A. It was right the last day or two of August.
Q. Can you tell the jury what happened in that conversation.
A. Well, he told me he was giving his notice, he was going to be quitting in 30 days; and we talked a little bit. I told him I hated to see him leave and asked if there was anything I could do to get him to stay. He said he had been offered a job working for a friend and could make twice what I was paying him, so I couldn't -- I couldn't compete with that. So I let him go.
Q. Did he tell you what new business or what new field of work he was going into with this friend?
A. Yeah. He was going to gun trade shows.
Q. Prior to that conversation in late August, 1994, had you and Mr. Nichols ever talked about gun shows?
A. No.
Q. Do you know whether he had an inventory of guns or anything of the like?
A. Not to my knowledge.
Q. Had he told you he had ever attended a gun show before?
A. No.
Q. Did Mr. Nichols tell you in that conversation the name of

Q. Did Mr. Nichols tell you in that conversation the name of the friend with whom he was going to go into the gun show business?

Timothy Donahue - Direct
A. No.
Q. In the course of the time that Mr. Nichols worked with you, did he ever mention any male friend by name?
A. Yes.
Q. And how many different people?
A. Just one that I remember.
Q. And what name was the one friend he mentioned to you?
A. Tim.
Q. And when did he first mention the name Tim to you?
A. Oh, it was the last 60 days, maybe, that he worked there.
Q. And what information did Mr. Nichols tell you about this friend named Tim?
A. He told me he had a friend named Tim that was in Desert Storm and the government had implanted a chip into him that monitored his whereabouts.
Q. Did he tell you anything about what business Tim was in?
A. No.
Q. All right. When you had the conversation with Mr. Nichols about leaving to join the gun show, did he tell you the friend he was referring to was this person named Tim?
A. No.
Q. In the course of your employment with Mr. Nichols, the two of you together, do you recall a conversation where Mr. Nichols told you about building a bomb from fertilizer?
A. Yes.

Timothy Donahue - Direct
Q. Do you remember approximately when that conversation took place?
A. It was the last 30, maybe 60 days that he worked there.
Q. And do you recall who was present?
A. Just me.
Q. Yourself and Mr. Nichols?
A. Yes.
Q. Where did the two of you have an opportunity in the course of a day to have conversations?
A. A lot of times it was in the pickup going to and from the job site.
Q. Could you tell the jury what you and Mr. Nichols talked about concerning making bombs out of fertilizer?
A. Well, it's just related to that fact; that I believe we was talking about fertilizer in general and that he made a statement that he knew how to make bombs using fertilizer and that he had -- they'd used it -- him and his brother had used it up in Michigan to blow up rocks and tree stumps.
Q. Did he say anything about being proud that he knew how to make a bomb out of fertilizer?
MR. TIGAR: Object to the leading, your Honor.

THE COURT: Yes. Sustained.
BY MR. MACKEY:
Q. What other details did you learn in this conversation from Mr. Nichols?

Timothy Donahue - Direct
A. About building the bomb?
Q. Yes.
A. Not really anything, I guess. It wasn't a lengthy discussion that I remember. It -- he just made that statement and that -- well, that they had tried several attempts to blow up this one rock and finally had increased the charge enough to get it done.
Q. Mr. Donahue, did you and Mr. Nichols ever talk about Waco, Texas, and the events at Waco, Texas?
A. Yes.
Q. Do you remember when and where that happened?
A. That was also in the pickup going to and from the job site; and that was towards the end, I'd say last 30 days.
Q. Describe to the jury what was said in that conversation.
A. Well, he was talking about government and being too big and too powerful and that they had abused their power and raided some -- raided the compound at Waco and killed some innocent people.
Q. And those were his words?
A. Yes.
Q. Did he describe his view about the government because of Waco to you at that time?
A. Yes.
Q. And how did he say it?
A. Well, it's just too big, too powerful, too much power.

Timothy Donahue - Direct
Q. In the course of your relationship with Mr. Nichols, do you recall a conversation where he mentioned the overthrow of the government?
A. Yes.
Q. Tell the jury when and where that happened.
A. Well, again, that was in the pickup going to and from the job site. And again, it was towards the end, the last three, four weeks of his employment there. And he often talked about government being too big and too much power and that he felt that the government needed to be overthrown and that Thomas Jefferson had written that it was our duty to overthrow the government when it did get too powerful.
Q. Prior to that time in the conversation with Mr. Nichols, had you ever heard anybody else make that kind of remark?
A. No.
Q. Mr. Donahue, I want you to take a look at a photograph previously admitted into evidence, Government's Exhibit 318.
A. Okay.
Q. Do you know the person that's shown in that photograph?

A. Yes.
Q. You can take your pen and clear the screen, please.
A. Okay.
Q. And who is that?
A. That's Timothy McVeigh.
Q. Prior to the time that Mr. Nichols left work for you the

end of September, 1994, had you seen Tim McVeigh at the Donahue Ranch?
A. Yes.
Q. On how many different occasions?
A. Two times.
Q. At the time you saw Mr. McVeigh at the Donahue Ranch, did you know his name and identity at that time?
A. No.
Q. All right. When and how did you later come to know that the person you had seen there was Tim McVeigh?
A. Well, the first time I realized his name was when I seen his picture on TV connected with it.
Q. In connection with the bombing?
A. Yes.
Q. So it would have been after April 19 of '95?
A. Yes.
Q. Let's return our attention to the first occasion that you saw Tim McVeigh at your ranch. Tell the jury when and where.
A. That was down at Clover Cliff. I was on one side of the highway preparing a tractor and implement to work in the field, and a small silver car drives up with two people in it. And the lady walks over to me -- I was outside the tractor -- and asked me where Terry was.
Then I realized it was Marife and --
Q. Who is Marife?

A. That's Terry's wife.
Then I walked over to the driver's door. It's a little bit difficult to explain how to get over to where Terry was; so I walked over to the driver and started to explain to him how to get over there and then just decided to lead him over there and told him to follow me.
Q. And did you do that?
A. Yes.
Q. And what happened on the other side of the highway?
A. He drove up to Terry, and they got out and talked for a while; and then I turned around and went back to my job.
Q. Do you remember approximately when that was that Mr. McVeigh came out to the field looking for Mr. Nichols?
A. Oh, that would have been towards the end, I would say -- I would say the last month again.
Q. Mr. Donahue, take a look at two photographs that are marked Exhibits 44 and 45.
A. Okay.

A. Okay.
Q. What are those, please.
A. That's Clover Cliff Ranch.
Q. Is that the same location that you first encountered Mr. McVeigh?
A. Yes.
MR. MACKEY: Your Honor, we'd move to admit those two exhibits, 44 and 45.

MR. TIGAR: No objection, your Honor.
THE COURT: All right. 44 and 45 are received, may be shown.
BY MR. MACKEY:
Q. Using the photographs, Mr. Donahue, can you show the jury where it was that you were working and where it was that you took Mr. McVeigh.
A. Just draw a line through the roads we took?
Q. Sure.
A. Okay. I was over in this area.
Q. The upper right-hand corner of the exhibit?
A. Yes.
Q. Okay. That would be on the, what, south side of the highway?
A. Yes. And then we got -- he followed me up here, the highway, right like that.
Q. There are a number of structures that are shown in that picture, sort of small, perhaps. But are those the ranch house, or the structures at Clover Cliff?
A. Yes.
Q. Can we see them better in Government's Exhibit 45?
A. Yes.
MR. MACKEY: Show that, please.
BY MR. MACKEY:
Q. And is this the same Clover Cliff Ranch that you mentioned

that the utility trailer was often located in the fall of 1994?
A. Yes.
THE COURT: We're at our usual time to recess.
MR. MACKEY: All right.
THE COURT: We'll have to have you back tomorrow, Mr. Donahue.
THE WITNESS: Okay.
THE COURT: You may step down now. Thank you.
Members of the jury, having arrived at our usual time for recess, we will do so with the cautions, of course, that I must again repeat. And, you know, as you hear more, I suppose you understand the scope of what you have to stay away from expands as well, because you've heard a lot this afternoon about chemistry and explosives and so forth. And obviously, those are things you must stay away from, too. You must avoid

anything that could touch and concern the issues to be decided in this case. We ask your cooperation in that regard.

And also, of course, you must continue not only to avoid discussion among yourselves but with all other persons about anything happening here in the trial and also in your own minds reserve any judgment until you've heard it all. You're going to hear a lot more than what you've heard so far.

So please continue to follow these cautions, being careful about all that you may read, see, and hear and publications and communications of any type so that you can be true to your oath in this case.

You're excused now till we resume at 9:00 tomorrow morning.

(Jury out at 5:02 p.m.)

THE COURT: Mr. Tigar?

MR. TIGAR: May the witness be admonished -- is it your Honor's practice to do that? Or counsel can, perhaps.

MR. MACKEY: I certainly --

THE COURT: I rely on counsel to avoid discussions with the witness and to remind him of his obligations.

MR. TIGAR: Very well, your Honor. That's certainly acceptable to us. I just wanted to know your Honor's practice.

MR. MACKEY: For the record, I'd like to move to admit Government's Exhibit 46C.

THE COURT: Did it work?

MR. MACKEY: Yes, it did. Yes, it did.

MR. TIGAR: May I look, your Honor?

THE COURT: Yes, of course.

MR. TIGAR: It's virtually illegible, your Honor; and I have no objection to it, however.

THE COURT: It can't hurt if you can't read it, I guess.

MR. TIGAR: That's right.

THE COURT: 46C is received.

MR. MACKEY: Thank you, Judge.

THE COURT: All right. We'll be in recess. 9:00.

(Recess at 5:04 p.m.)

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INDEX

PLAINTIFF'S EXHIBITS

Exhibit	Offered	Received	Refused	Reserved	Withdrawn
40-41	7131	7132			
42-43	7133	7134			

44-45	7155	7156
46A	7147	7147
46C	7158	7158
69	7032	7033
158B	7072	7072
158C-158F	7073	7073

PLAINTIFF'S EXHIBITS (continued)

Exhibit	Offered	Received	Refused	Reserved	Withdrawn
674	7026	7026			
675	7029	7029			
678	7036	7036			
681	7037	7038			
682	7039	7039			
685	7055	7055			
689	7054	7054			
690	7065	7065			
691	7051	7051			
692	7046	7047			
693	7052	7052			
1298	7067	7067			
2045	7127	7127			
2071-2074	7143	7144			

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REPORTERS' CERTIFICATE

We certify that the foregoing is a correct transcript from the record of proceedings in the above-entitled matter. Dated at Denver, Colorado, this 5th day of November, 1997.

_____
Paul Zuckerman

_____
Kara Spitler