UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

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DYNAMIC AIR INC.,

Petitioner,

v.

M-I DRILLING FLUIDS UK LTD.,

Patent Owner.

_____

Case IPR2016-00256
U.S. Patent No. 6,702,539 B2

Case IPR2016-00259
U.S. Patent No. 7,544,018 B2

Case IPR2016-00260
U.S. Patent No. 7,033,124 B2

Case IPR2016-00262
U.S. Patent No. 7,186,062 B2

Case IPR2016-00263
U.S. Patent No. 7,186,062 B2

Case IPR2016-00264
U.S. Patent No. 6,709,217 B2

DEPOSITION OF

JOHN W. CARSON, PhD

VOLUME I

TUESDAY, AUGUST 9, 2016

Taken By Christine K. Herman, RPR, CRR

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The original is in the possession of

Attorney Rose

* * *

INDEX:

THE DEPOSITION OF JOHN W. CARSON, PhD, taken pursuant to Notice of Taking Deposition, taken before Christine K. Herman, RPR, CRR, a Notary Public in and for the County of Anoka, State of Minnesota, taken on the 9th day of August, 2016, at Capella Tower, 225 South Sixth Street, Suite 4200, Minneapolis, Minnesota, commencing at approximately 9:00 a.m.

P R O C E E D I N G S

Whereupon,

JOHN W. CARSON, PhD,

a witness in the above-entitled matter,

after having been first duly sworn,

deposes and says as follows:

EXAMINATION

BY MR. ROSE:

Q Good morning, Dr. Carson.

A Good morning, Mr. Rose.

Q You understand you're here in connection with several inter parties review matters before the Patent Trial and Appeal Board?

A I do.

Q And just for the record, those matters are IPR 2016-00256, '259, '260, '263 and '264. Is that all of those? And '262.

Dr. Carson, you've had your deposition taken before, correct?

A I have.

Q Approximately how many times?

A Probably 50 or more.

Q Okay. So you understand the role of asking questions and -- I'll ask the questions and you give the answers?

A Yes.
Q Okay. And if I ever ask a question that you don't understand or you didn't hear completely, please let me know. I'll do my best to rephrase it. If you don't say that you don't understand the question or ask me to rephrase it, we'll understand that you understood the question. Fair enough?
A Yes.
Q If during the day you need any breaks, just let me know. We'll do our best to accommodate you. If there's a question pending, however, I'll need you to answer that question and maybe a follow-up before taking a break, but if you do need a break just let me know, okay?
A Yes.
Q I'd like to turn first to Exhibit 1035.
(Previously Marked Deposition Exhibit Number 1035 introduced to the witness.)
Q (BY MR. ROSE) Do you recognize Exhibit 1035 as your curriculum vitae?
A This -- Yes. This is my CV as of June 2015.
Q Then my next question, which is, is this your most recent CV?
A It is my most recent CV; that is, the

first page, which is here listed as page number 3. What follows are a list of my publications, and the last publication is dated September/October 2015. There's two or three papers that I've published since that time that are not listed here.

Q Okay. Do you have a more recent version of your CV that you could provide?

A I do.

Q Okay.

MR. ROSE: I'd ask that that be provided.

Q (BY MR. ROSE) Do you recall what the more recent publications were?

A Not off the top of my head, no.

Q And all of your undergraduate and postgraduate degrees, I see from your CV, dealt with mechanical engineering; is that correct?

A Yes.

Q Did they deal with any particular specialty within the field of mechanical engineering?

A Yes.

Q What particular fields?

A My graduate degrees in master of science and PhD from MIT both dealt with the field of elastic-plastic fracture of metals.

Q Could you describe briefly what that is?
A When a metal, steel or whatever, aluminum, is deformed, if the amount of deformation or stress that is applied to the metal is rather low, then the response is called elastic. Basically the metal returns to its original condition when that stress is relieved. If a greater amount of stress is applied to the material, you exceed what's called the elastic limit, and the material deforms in such a way that it does not return to its original condition when that load or stress is removed, and that's called plastic deformation. So in my master's and PhD work, I investigated the conditions of failure of metals in this regime, where the material starts out with an elastic response and later goes to a plastic response.
Q Were any of those studies -- Strike that.
Did any of those studies involve the flow of granular solids?
A Those specific studies did not, no.
Q Okay. And I see that starting in 1970 you began work with Jenike & Johanson. Did I pronounce that correctly?
A You did pronounce it correctly, and I did start full time in 1970, but I actually worked for

the company in the summer of 1967.

Q What did you do there in the summer of 1967?

A I performed research on the settlement of powders.

Q And were you -- Was that after you had received your undergraduate degree?

A Yes.

Q And then you went back to work in 1970. In what role were you there in 1970?

A At the time we were a very small company. We're still small, but not as small as we were then. And I don't recall exactly what my title was. It was probably project engineer or something of that sort.

Q Could you describe generally the type of work you did as a project engineer beginning in 1970?

A The work that I performed at that time consisted of reviewing test results from our laboratory, interacting with clients, either in a site visit or by phone or mail -- that was before the days of e-mail -- and analyzing problems that clients were having or design conditions that they would like to establish, and then taking that test

data and their design requirements and coming up with a report with sketches, showing the reasons why they were having problems or how to avoid problems and recommendations thereto.

Q You said testing results from your laboratory. What kind of a lab did you have? Was it a unit operations type of lab?

A No.

Q Could you describe the lab facility?

A The lab facility that we had then was -- or consisted of what is called a Jenike shear tester. I think at the time we perhaps had only one such device. But this is a device to measure the flow properties of bulk solids. We had associated equipment called a consolidating bench, a heated chamber, compressibility tester, a permeability tester, and then other typical lab equipment, such as ovens and balances and things of that sort.

Q You said you tested the flow properties of bulk solids. Could you give me a definition of what you mean by bulk solids?

A The term bulk solids is generally recognized to encompass particles of virtually any size or shape, from submicron to mining applications, where particles could be the size of

this table. And those particles are handled in bulk form; that is, that the material is put into a container of some size and shape, and then one attempts to remove the particles from that container, as opposed to the other type of so-called material handling, which is unit handling, where with regard to particles, you might put those particles in a container, and then you'd be worried about how to -- or concerned with how to move that container from one point to another. Here the issue is filling and discharging the container.

Q And is there a difference between -- well, is there a distinction between bulk solids and bulk granular solids?

MR. WERNER: Objection to form.

A There is no meaningful distinction. The terms are used interchangeably.

Q (BY MR. ROSE) Okay. On your CV you say that you specialize in the storage and flow of bulk granular solids. So that's the same field as you described earlier with particles from submicron to the size of this table?

A Yes.

Q What is the business of Jenike & Johanson?

A Jenike & Johanson is a consulting

engineering firm that specializes in the storage, flow and processing of bulk solids.

Q So Jenike & Johanson, does it manufacture any products?

A We do not have a product line per se. We do sell -- We have in the past sold Jenike shear testers. We have discontinued that for the last 10 years or so. We do sell a -- We have an exclusive arrangement with Dr. Dietmar Schulze in Germany to sell the Schulze ring shear tester worldwide, with the exception of Europe, which he controls.

For clients that have a need for customized equipment, whether it be screw feeders, pneumatic conveying systems, bins, silos, processing vessels, we have capabilities to engineer such equipment, to design and engineer such equipment, and then either to construct that equipment in house, or more likely, and more often, to work with an outside vendor to have that equipment constructed.

Q And other than those instances where Jenike & Johanson provides design and engineering services, and perhaps construction of equipment, the business of Jenike & Johanson is consulting, correct?

A Yes. I would say in general that statement is correct. Consulting both in terms of solving problems with existing equipment or designing new equipment to avoid problems.

Q How big of an entity is Jenike & Johanson? For example, how many employees?

A To answer your question I need to describe the structure of Jenike & Johanson.

Q Absolutely.

A There is an umbrella organization called Jenike & Johanson Global, Inc. It's a Massachusetts corporation. It's basically a shell that then controls the various subsidiaries. Our U.S. subsidiary is Jenike & Johanson, Incorporated, again a Massachusetts corporation. Our Canadian subsidiary is Jenike & Johanson, Limited, located in Toronto. We have a subsidiary in Chile, which is Jenike & Johanson Chile Limitada. I'm not sure of that last 'cause there are actually two entities in Chile, so Chile Limitada may be -- it's either that or Jenike & Johanson Chile, S.A. I'm not sure exactly the corporate structure there.

We have another entity in Brazil going by the name of Jenike & Johanson. And we have an entity in Australia, Jenike & Johanson Australia.

Combined, these various subsidiary companies have a total of close to 100 employees.

Q And how many employees of the U.S. entity?

A The U.S. entity is the largest number of employees. I would estimate around 60 employees U.S.

Q And as the president -- Well, strike that.

When did you assume the role of president?

A January 1985.

Q Is that president of the U.S. entity or the entire entity?

A I'm president of the U.S. entity, and I believe my role is secretary of the global entity. Secretary and maybe treasurer. I'm not sure.

Q What do you do in your role as secretary or treasurer of the global entity?

A I am a member of the board of directors of Jenike & Johanson Global, as well as Jenike & Johanson, Inc. In my role as secretary and treasurer of Jenike & Johanson Global, I primarily take notes at board meetings and, obviously, sign any legal documents that require a signature of the secretary.

Q And do you have regular interaction with the entities outside the U.S. as your role as either

a board member, secretary or treasurer?
A I do.
Q What are the interactions you have with those other entities outside the U.S.?
A There are multiple interactions. We have -- In the case of our operation in Canada and in Chile, we have an individual who is on the board of directors of Jenike & Johanson Global, so I have a close interaction with that individual or those individuals. Beyond that, I have interaction with engineers at these other entities as needed, to either assist them or to request their assistance on projects that they are involved with.
Q Does that include interaction with engineers at Jenike & Johanson Brazil?
A Yes.
Q How often do you interact with those engineers?
A I just had one of those engineers in our office for the last three weeks. I was out of the office for two of those three weeks, but I talked with her while she was there. But perhaps once every couple of months, or maybe even monthly, I'll have an e-mail exchange or a phone call with the head of our office in Brazil.

Q Has the Jenike & Johanson -- Strike that.
Are you familiar with an entity known as Dynamic Air Limitada?
A I've heard of that entity, yes.
Q Has the Jenike & Johanson entity in Brazil had any interaction or done any business with Dynamic Air Limitada?
A Not that I can recall.
Q Has Jenike & Johanson conducted any business other than your involvement in this matter with Dynamic Air, Incorporated?
A I cannot recall any interaction with them.
Q You're not familiar with any consulting services that Jenike & Johanson provided for either Dynamic Air, Incorporated, or Dynamic Air Limitada?
A No.
Q I see that in your --
(Previously Marked Deposition Exhibit Number 1044 introduced to the witness.)
Q (BY MR. ROSE) I'm handing you what's been marked previously as Exhibit 1044. Do you recognize this as one of your declarations in the matters for which we are here?
A I do.
Q And I want to direct you to, starting on

page 4, where you list matters in which you've testified in the last four years. Are you there?

A Yes.

Q And in each of those matters did you provide deposition testimony?

A No.

Q You know, I worded my question poorly. Why don't we walk through each of them at a time, and you can tell me -- Or strike that.

Is it your testimony that you gave deposition testimony in none of those matters?

A No.

Q Okay. That's what I wanted to clarify. So for the first one, Ulysse Daigle, plaintiff, did you give deposition testimony in that case?

A Yes.

Q Did you give trial testimony?

A No.

Q And Falcon Concentrators, Inc., did you give deposition testimony in that one?

A Yes.

Q And did you give trial testimony?

A No.

Q In Alfred Palma, LLC, did you give deposition testimony?

A I believe I did, yes.
Q And did you give trial testimony?
A I may have. I don't recall.
Q Tharaldson Ethanol Plant, did you give deposition testimony in that one?
A No.
Q Did you give trial testimony?
A Yes. It was an arbitration.
Q You testified at the hearing, though?
A I did.
Q In Illinois River Energy, did you give deposition testimony?
A Yes.
Q Did you give trial or hearing testimony?
A No. There was no trial.
Q In ALSTOM Power Systems, did you give deposition testimony?
A No.
Q Did you give trial or hearing testimony?
A Yes.
Q In Green Plains Bluffton, did you give deposition testimony?
A Yes.
Q And trial testimony?
A No.

Q In Secretary of Labor, in that matter did you give deposition testimony?
A Yes.
Q And did you give trial or hearing testimony?
A No.
Q And PhosAgro Asia, in that matter did you give deposition testimony?
A No.
Q Did you give trial or hearing testimony?
A I did.
Q And in the last one, Marie Jose Pierre, did you give deposition or trial testimony?
A Yes.
Q You gave a deposition?
A Deposition, yes.
Q And trial?
A No.
Q Did any of these matters that we've just walked through involve patents?
A Yes.
Q Which ones were patent cases?
A The second one, Falcon Concentrators, Inc.
Q Any others?
A No.

Q And that was in the Canadian court; is that right?
A Yes.
Q Do you know what the outcome of that matter was?
A I know the matter was settled before going to trial, but I don't recall any details beyond that.
Q Do you recall whether you gave testimony on the side of the patent owner or the nonpatent owner?
A The patent owner.
Q Okay. And what was the -- we're not getting into anything that might be confidential -- the general subject matter of your opinions?
A The issue had to do with a device for processing of what are called tailings or refuse material in the minerals application, and the issue had to do as to whether or not there was -- whether or not the configuration of a key component of this device constituted a mass flow condition.
Q And you gave opinions on the side of the patent owner; is that right?
A That's correct.
Q Okay. Did the issue have to do with

whether the accused product infringed the patent?
A Yes.
Q And what conclusion did you reach as to whether the accused product infringed?
A As I recall, my conclusion was that there was infringement, that the patent was valid and that there was an infringement.
Q So you also gave opinions regarding the validity of the patent?
A As I recall, I did, yes.
Q You said that the -- one of the issues was whether or not the configuration of a key component of the device constituted a mass flow condition. What did you mean by that, a mass flow condition?
A Mass flow is a term that was originated by Dr. Andrew Jenike in the early '60s -- late '50s, early 1960s, and it's generally recognized throughout the world as a condition where, when material is put into a storage vessel of any size or shape, if upon initiating discharge from that storage container or storage vessel all of the material is in motion whenever anything is withdrawn, that is considered to be mass flow. Basically no stagnant regions of material on discharge.

Q And in that case did you find that there was a mass flow condition?
A Yes.
Q How did you determine that?
A By considering the properties of the material that was being handled and by the configuration of the vessel itself.
Q Did you do any actual testing, or you just determined the properties of the material and the configuration of the vessel?
A I did no testing.
Q So there's some mathematical formula based on the properties of the material and the configuration of the vessel that enable you to determine mass flow?
A Yes.
Q Can you describe what that formula is?
A This is all -- It's difficult to describe in a few words, but basically I would reference Bulletin 123 from the University of Utah experiment station, authored by Andrew Jenike in the early '60s as, if you will, the Bible of the industry that describes the conditions under which mass flow can develop.
Q We may have touched on this before. If I

did, I apologize. But can you give me what definition you have for the term granular solids? How would you define that term?

A As I testified earlier, Mr. Rose, the term bulk solids, bulk granular solids, bulk material, are, in my mind, all interchangeable terms, but basically consisting of particles of virtually any size or shape that is handled in bulk form.

Q And what does the use of the word granular indicate?

A It really doesn't add any more. It's a term that's often used, but I think it sometimes gives the impression that the particles are of some size that are smaller than submicron and larger than the size of this table. But, again, to me, it's not a well-defined term, and, in fact, it may actually create a misunderstanding of what we mean by bulk solids. But, again, I don't differentiate between a bulk solid and a bulk granular solid, and I believe that's true of most people in this field.

Q And the same thing with the term granular solids?

A Yes.

Q Okay. So when you say -- just trying to help me understand here -- it could be the size of

this table, this table is some 20 feet long. If we're moving a series of these tables down a conveyer belt, is that the conveyance of bulk granular solids?

A Yes.

Q Okay. And that would be captured by, in your CV, Exhibit 1035, where you say that you specialize in the storage and flow of bulk granular solids?

A Yes.

Q Now, the testimony you gave in the Falcon Concentrators, Inc. case, I see it was in Canadian court, but that also had to do with a Canadian patent; is that right?

A Yes.

Q Okay. Have you had any experience, any testimony experience regarding U.S. patents?

A Yes.

Q Okay. When was that?

A I had one this year, and I had two other matters that date back to probably the mid 1970s, late 1970s.

Q What was the one that you had this year?

A I don't recall the actual caption, but it was somewhere along the lines of SNF Flopan,

F-L-O-P-A-N, vs. BASF Corporation.

Q Do you know where that case was pending?

A It was an IPR case. I was working with an attorney in Houston, so my deposition was taken in Houston. When you say where it was, there or Washington, D.C., I don't know.

Q But it was an IPR?

A It was an IPR, correct.

Q And for which of those two entities did you provide opinions?

A BASF.

Q Was BASF the patent owner?

A Yes.

Q And your opinions had to do with the validity of the patent?

A That's correct.

Q I assume one patent, or more patents?

A As I recall, there was just a single patent.

Q Would you tell me how long ago that deposition was?

A Two or three months ago.

Q Does that matter remain pending?

A No. In fact, I just received an e-mail last night with a final decision by the IPR that was

in favor of my client.

Q So the patent was upheld as valid?

A It was.

Q Do you have any patents of your own?

A Yes.

Q Can you estimate roughly how many?

A One.

MR. WERNER: Rough estimate.

Q (BY MR. ROSE) And how long ago did you get that patent?

A Roughly 20 years ago.

Q Can you tell me generally what the subject matter was?

A Fluidization segregation tester.

Q Was that patent ever involved in litigation?

A No.

Q And you got that patent while you were at Jenike & Johanson?

A Yes.

Q Was the validity of that patent ever challenged?

A No.

Q So just so I'm understanding clearly -- I think I am -- other than the BASF case and the

Falcon Concentrators case, you haven't opined in patent litigation, correct?

A That's not what I said.

Q Okay. Maybe I'm misunderstanding. Are there any other patent cases where you've given opinion testimony other than the BASF and the Falcon Concentrators?

A Yes. I've already testified that I had two matters back in the '70s.

Q Okay. That's right. I apologize. Other than those, are there any more?

A No.

Q Roughly what percentage of your work at Jenike & Johanson involves giving opinions in litigation?

MR. WERNER: Objection to form.

A At the present time, for me personally, it's more than 50 percent. That's an average. It varies, obviously, from month to month, but I would say, over the course of a year, it's somewhere in excess of 50 percent.

Q (BY MR. ROSE) Have you ever been engaged by the Carlson Caspers firm?

A No. Not prior to this case, obviously.

Q Yes. Thank you for clarifying. Have you

ever been engaged or performed work for Dynamic Air, Incorporated?

A You already asked me that question, and my answer is I don't recall having done so, either personally or by the corporation.

Q Have you had any prior dealings or been engaged by Macawber Engineering, Incorporated?

A How do you define dealings?

Q Well, in your work at Jenike & Johanson do you have any interaction with Macawber Engineering?

A I have in the past.

Q Could you describe what interactions you've had with Macawber Engineering?

A Well, for me personally, I've known Brian Snowdon, who is one of the principals -- in fact, he's the author of these patents. I've known Brian for probably 30 plus years. Maybe 40 years. I recall working with him on a project in Spain. In fact, it's mentioned in the Macawber Coal-Fired Ships exhibit. A project where he and his firm were involved in the pneumatic conveying portion of that project, and I was involved in the equipment upstream of the pneumatic conveying, so I interacted with Brian, and that goes back some years. I'm not sure who else. But certainly I recall working with

Brian on that. Beyond that and meeting Brian and others at trade shows and conferences, I don't have any specific recollection.

Q Have you done any work for Macawber Engineering in your role at Jenike & Johanson?

A I don't recall any, no.

Q You had mentioned a project that you had worked on with Brian Snowdon. He was involved in the pneumatic conveying portion of the project, and you were involved in the equipment upstream. Could you describe what you meant by that?

A As described in the Macawber Coal Ship exhibit, this project involved designing a ship that would not only transport coal but would also take some of that coal and put it into a combustor and be the source of steam for powering the ship. So what we were looking at is the design of the bunkers, the hoppers, the feeding devices, to reliably discharge the coal into the downstream equipment, which in this case was a Macawber Denseveyor.

Q So the work regarding the Macawber Denseveyor, is that the work that Brian Snowdon was doing?

A Yes.

Q Okay. And then you were working on the --

was it the work involving the bunkers, the hoppers and the feeding devices?

A That's correct.

Q Okay. How long ago was that project?

A The early '80s. Maybe even the late 1970s. It was quite a while ago.

Q At that time did Brian Snowdon have more experience with the pneumatic conveying than you did?

A I would say yes.

Q So that's why he was working on the Macawber Denseveyor portion of the project?

MR. WERNER: Objection to form. Calls for speculation.

A No. I wouldn't say that at all.

Q (BY MR. ROSE) Do you know why he was working on that portion of the project and you were not?

A Macawber was -- and subsequent companies that have taken over Macawber -- a supplier of pneumatic conveying equipment, so it was appropriate that the client make a decision as to who that supplier would be and then work with them for their -- for the supply of that particular equipment. My role was the upstream equipment,

where it was more of a design of the vessel issue, and, therefore, using my expertise and that of my firm to design the upstream equipment so that the material would reliably feed into this commercial equipment that Macawber was supplying.

Q Turning back to your declaration, Exhibit 1044, on page 4, the heading Roman III is Compensation and Prior Testimony. And under that you list the testimony of the cases we've already discussed. Do you identify in there how much you were being compensated for your testimony in this case?

A No. This was a typo. I should have removed that.

Q How much are you being compensated for your testimony in this case?

A 350 an hour and $3,000 a day for testimony.

Q Is that paid directly to you, or does that go to Jenike & Johanson?

A The latter.

Q How did you first come to be involved in this case?

A I received a call from Alan Carlson, attorney Alan Carlson, sometime in November of last

year.

Q And what did Mr. Carlson ask you to do?

A He indicated that he was and is an attorney representing Dynamic Air in litigation involving these particular patents and wanted to know if I and my firm would be willing and interested in assisting in this litigation -- or this patent matter.

Q Had you worked with Mr. Carlson or his law firm previously?

A No, I have not.

Q Had you known him from any other connection before?

A No.

Q Do you know how he ended up with your name and contact?

A I do not.

Q And what materials did Mr. Carlson or his firm provide you?

A He and his firm provided me with copies of the relevant patents. He and others of his firm provided me with various background documents, including publications, technical papers, product literature, other patents. He provided me with videos showing examples of drill cuttings. He

provided me with the prosecution history. He and others at his firm provided me with prosecution history of the patents that are in question. I think that's a reasonably complete description of what he and others at his firm provided me.

Q When he first contacted you did he inform you that he wanted to engage you to opine that the patents were invalid?

MR. WERNER: Objection to the form. And we're getting into the close topic of discussions with the expert about what I believe to be work product information and not the fair scope of examination.

MR. ROSE: Okay.

MR. WERNER: But I'll -- You can answer this question on a nonwaiver basis.

A No. He didn't indicate he wanted me to testify one way or another. It was simply to be of assistance in understanding the issues and developing an opinion.

Q (BY MR. ROSE) You had listed several materials that were provided to you by Mr. Carlson and his firm. Does that include the prior art references that you rely on in your declarations?

MR. WERNER: Objection to form.

A Most of the prior art references were ones that he provided, yes.

Q (BY MR. ROSE) Did you do any searching on your own?

A Yes.

Q Which references did you locate on your own that were not provided by Mr. Carlson or his firm?

A My firm had already -- we had already had copies of the Marcus book. We did not have a copy of the first edition, but we had copies of the, I believe, second and third. Maybe there's a fourth edition. So I was certainly aware of that reference, although I didn't have that particular edition.

We had in our files copies of Macawber literature. I don't recall if we had the specific ones that are listed as exhibits, but certainly we were well aware of the company and their products. Those are the only things that I can think of at this moment.

Q But the first edition of the Marcus book was provided by Mr. Carlson or his firm?

A That's correct.

Q And then while you did have in your files

Macawber literature, was some of the literature that's cited in your declarations, was that also provided by Mr. Carlson or his firm?

A Yes.

Q Looking at page 6 of your declaration, Exhibit 1044, the second bullet on page 6 is the prosecution history of each of the patents. Do you recall if you read the prosecution histories of those patents?

And let me take a step back. Do you know what a prosecution history is?

A Yes.

Q Okay. Did you read the prosecution histories of those patents?

A I read some of them. I skimmed most of them.

Q All right. And in the Marcus book, which is the third bullet, pneumatic conveying, did you -- you just read portions of that?

A Yes.

Q Okay. Did counsel direct you on which portions to read?

A No.

Q How did you make the decision which portions to read and which portions not to read?

A It was quite obvious from just the topics that are in that book as to which would be applicable to this matter and which would not.

Q The U.S. patents listed below the Marcus book, those were all provided by Mr. Carlson or his firm?

A Yes.

Q Who prepared the first draft of your declarations?

MR. WERNER: Objection to form.

A There were several of us that were involved in not only the first but subsequent drafts. I certainly participated in that effort. There were two engineers, key engineers in my company that were involved, as well as attorneys from Mr. Carlson's firm. So we worked collaboratively on both the first draft as well as the subsequent drafts.

Q (BY MR. ROSE) So when you first saw a document that ultimately resulted in being your -- one of your declarations, was that something that was prepared by the Carlson firm and then sent to you?

A I don't recall.

Q Who were the other individuals that helped

work on your declarations?
A Primarily Brian Pittenger, P-I-T-T-E-N-G-E-R, and Eric Maynard, M-A-Y-N-A-R-D. And I believe Dr. David Craig, C-R-A-I-G, provided some assistance, but very limited.
Q These are all folks at Jenike & Johanson?
A Yes.
Q And they were compensated as well for their time?
A As employees of the company.
Q Jenike & Johanson was compensated for their time, correct?
A Yes.
Q Do you know how much so far Jenike & Johanson has billed for this matter?
A I don't know.
Q Can you estimate it?
A It's probably in the range of 30- to 50,000, but I honestly don't know. That's just speculation on my part.
Q Do you know roughly how much time you have invested in this matter?
A I don't. I don't know that number off the top of my head, no.
Q When I asked you about the prosecution

histories that are identified as the second bullet on page 6 of Exhibit 1044, you said you read some and you skimmed others. Were you told by someone which to particularly read and which ones to just skim?

A I don't believe I was, no.

Q How did you make that decision?

A As I recall, I skimmed all of the prosecution histories and just then focused on particular pages that I thought would be helpful in developing my opinion.

Q What did you do to get ready for this deposition today?

A I reread all of my declarations, all six of them; I reviewed the key reference documents that are listed here on page 6 and 7; and I met with the attorneys from Mr. Carlson's firm yesterday.

Q How long was that meeting?

A Roughly six hours.

Q Those are the attorneys that are here today?

A Plus Mr. Carlson, yes.

Q Was there anybody else involved in those meetings?

A No.

Q You said you reviewed the key reference documents. Which ones are those? And if you've identified them on Exhibit 1044 that'll help.

A Well, obviously the patents themselves. That's the first bullet. The Marcus reference, which is the third bullet; the fourth, fifth and sixth references, which are the Ciaffone and Dietzen I and Dietzen II; the Laster patent; the 1989 DAI Publication; Macawber; second Macawber brochure, Macawber Coal Ship; DAI Molding Sand publication; Cyclonaire. I think I listed DAI Basics, but I may not have. 1989 DAI publication, the Toth patent, ISO standards. That would be the extent of the ones that are listed.

MR. ROSE: We've been going about an hour now. It's probably a good time for a quick break.

(Whereupon, the proceedings were in recess at 9:59 a.m. and subsequently reconvened at 10:11 a.m., and the following proceedings were entered of record:)

Q (BY MR. ROSE) Dr. Carson, I want to go back and just touch base and make sure I'm understanding something clearly regarding the -- When we talk about the definition of bulk solids and granular and you had used the example as something

as large as this table here, if this table was being moved on a conveyor belt, would that be the flow of a bulk solid or is that just movement? Is there a difference between movement and flow?

A I don't consider any difference between the two, no.

Q All right. If somebody picks up the table and moves it is it flowing?

MR. WERNER: Objection to form.

A I think these are, in my opinion, extreme examples. The issue, as I testified previously, Mr. Rose, is that we're dealing with particles, not a single particle but particles that are in contact with other particles, and those particles are being moved in some way. Very often that movement is in a bin, a hopper, a silo, a bunker, some sort of storage vessel.

In some cases that movement is by some sort of a feeding device or metering device, such as a rotary valve, a screw feeder, a belt feeder, vibrating hand feeder. In other cases that movement is by mechanical means, such as a screw conveyor or a belt conveyor. In some cases that movement is by pneumatic means, so either a positive or negative pressure and pneumatic conveying system. All of

those encompass flow, as I use the term.

Q (BY MR. ROSE) Why don't we talk about some different terms, and that may help us going forward. What is your understanding or interpretation of the word viscosity?

A Viscosity is a term that is used to describe the resistance to flow of a liquid.

Q So if something has high viscosity, that means it has high resistance to flow?

A Yes.

Q Okay. What about elasticity?

MR. WERNER: Objection to scope.

A In reference to what?

Q (BY MR. ROSE) To the conveyance of materials.

MR. WERNER: Same objection.

A I don't see the connection between conveyance and elasticity, necessarily.

Q (BY MR. ROSE) Do you have a general definition or understanding of the term elasticity?

MR. WERNER: Objection to form and scope.

A As I testified previously, Mr. Rose, in terms of my PhD work, when it comes to metals, elastic behavior or elasticity refers to a condition in which the metal is capable of returning to its

initial condition or a condition that it had before it was stressed or strained.

Q (BY MR. ROSE) Okay. And then the plasticity, I think you had said elastic-plastic fracture. Does plasticity have to do with when it doesn't return?

A Yes. It's basically nonrecoverable definition.

Q Okay.

A Again, those are the terms that are used in reference to metals. Now, Jenike, in some of his publications, has used the term plastic behavior in a slightly different way.

Q What is that way?

MR. WERNER: Objection to form and scope.

A Most bulk solids don't have the same elastic-plastic behavior as metals. Jenike used the term plastic behavior to connote or describe a condition where there is -- where you want to reach the yield limit of the bulk material, and it begins to flow in a nonrecoverable way, so there is -- while there is some similarity in terms of being nonrecoverable, the terms are used somewhat differently, or the term is used somewhat differently when it comes to metal behavior.

Q (BY MR. ROSE) Okay. What does the word -- the term yield limit mean?

MR. WERNER: Objection to scope.

A Again, the term is used differently when it comes to metals than with regard to bulk solids.

Q (BY MR. ROSE) Right. I'm referring to how you used it in your last answer. I didn't understand that term, and I'm hoping to get some clarification.

MR. WERNER: Same objection.

A Perhaps I can give a simple example of what a yield limit is.

Q (BY MR. ROSE) Sure.

A Consider that we have a container like this coffee cup, and we fill this container with a bulk solid, and we compress the particles in the container to a certain extent. We remove that load. The material is, in most cases, not going to spring back in any way. It's going to basically retain the consolidation that it had as a result, first of all, of gravity, and, second, by the application of this load.

Now, if I take this container and in some way remove the sidewalls of the container so all I have now is a column of particles that are cohesive

enough so that they retain the shape that they were in here, if I now take that column of particles and now apply a vertical load and keep increasing that load until all of a sudden that particle -- that mass of particles collapses, that's a rough description of the yield limit of that bulk material.

Q Okay. Can you describe what a Newtonian fluid is?

MR. WERNER: Objection to scope.

A A Newtonian fluid is one that has a particular stress shear strain relationship.

Q (BY MR. ROSE) Could you give me an example of what you mean by that?

MR. WERNER: Objection to form and scope.

A Water would be a good example of a Newtonian fluid.

Q (BY MR. ROSE) When you say it has a particular stress shear strain relationship, what does that mean?

MR. WERNER: Objection to scope.

A I really can't define it any better than that.

Q (BY MR. ROSE) Okay. Do you know what shear stress is?

A Yes.
MR. WERNER: Objection to scope.
Q (BY MR. ROSE) What's that?
A First of all, I talked about shear strain, not shear stress.
Q Okay.
A But do you want me to define shear stress?
Q Let's start with shear stress and shear strain, and maybe you can explain what the differences are to me.
A Well, the term stress, in the field of mechanical engineering, is what is called a tensor quantity, and that means that you can have both normal stresses and normal -- not as different from abnormal, but normal in the sense that they are stresses that are applying perpendicular to the face of that solid or collection of particles. So you have normal stresses and you have shear stresses. So normal stresses are applied perpendicular to a face of either a solid or an accumulation of solids, whereas shear stresses are stresses that are applied parallel to that face.
Q So you had said a Newtonian fluid is one that has a particular shear stress-strain relationship. Does that mean a relationship between

the shear stress -- Can you describe what that means?

MR. WERNER: Objection to the form. Scope. Asked and answered.

A Well, I've described to you shear stress.

Q (BY MR. ROSE) Okay.

A Strain, again, is a tensor quantity. There can be normal strain, which is perpendicular to a face, and shear strain, which is parallel to a face, so it's deformation in the shearing direction.

Q So it has to do with -- Correct me if I'm wrong. It has to do with, if there's stress in the parallel direction, it has to do with the strain in the perpendicular direction?

A No.

Q I'm not a very good student. So what is the particular shear stress-strain relationship of the Newtonian fluid?

MR. WERNER: Objection to form. Scope.

A Perhaps the confusion is the way I responded. What I intended to say and what I was expected -- what I thought I was saying is, it's a relationship between shear stress and shear strain.

Q (BY MR. ROSE) Okay. And then what is a non-Newtonian fluid?

A Again, it's a fluid that doesn't behave in a Newtonian fashion, so nondairy creamer might be an example of a non-Newtonian fluid.

Q Going back to my college days, is Silly Putty an example of a non-Newtonian fluid? I seem to recall that in my classes.

MR. WERNER: Object to the scope.

A I wouldn't consider Silly Putty to be a non-Newtonian fluid.

Q (BY MR. ROSE) Okay. Do you have an understanding of the term thixotropic?

MR. WERNER: Objection to scope.

Q (BY MR. ROSE) Or thixotropy?

A As I recall, a thixotropic material is one in which the behavior of the material changes as the material is deformed or sheared. So it's not a repeatable condition. For example, if you put material into a container and were to stir that material, the faster you stir it the properties would change, depending on the speed of the stirring.

Q Do you have a definition of what the term paste means?

MR. WERNER: Objection to form. Are you asking him with respect to the patent or generally?

MR. ROSE: 5'll ask generally. If it's different for the patents, then we'll explore that.

A Paste is not a well-defined term. I believe I stated in my declaration that my understanding is that the patent office examiner used the term paste or concluded the term paste and sludge can be used interchangeably, and I agree with that. It's not a term that is well-defined. It's basically a non-free flowing material. And when it's a paste or a sludge, again, I would use those terms interchangeably.

Q (BY MR. ROSE) You would use those terms interchangeably in connection with the patents or that and in general?

MR. WERNER: Objection to scope.

A The latter.

Q (BY MR. ROSE) And how would you define a sludge?

A A paste.

Q So there's no -- If you were to look at a material, how would you determine whether it's a paste or a sludge?

A I would look at how the material behaves when something is done to affect that material, such as pouring the material out of a container.

Q So how would a paste behave when poured out of a container?
A I would expect, first of all, there may be difficulty in pouring it at all, but if it does pour, it's going to pour in a very nonuniformed fashion. It may come out in clumps, or it may run out for a while and stop moving. So intermittent or no flow occurring as a result of trying to pour it from a container.
Q What's a fluidizing agent?
MR. WERNER: Objection to scope.
A A fluidizing agent, as used in the field of bulk solids handling, generally -- I'm sorry. Fluidizing agent? Was that your question?
Q (BY MR. ROSE) Yes.
A In the field of bulk solids handling, the term fluidizing agent usually refers to a gas, typically air, but it could be other gasses, that change the properties of the material that is being fluidized.
Q And how does the air change or the gas change the properties of the material?
MR. WERNER: Objection to form and scope.
A Basically what happens -- And this doesn't always happen. It depends on the material that's

being fluidized. But if a material is capable of being fluidized, the gas does a couple of things. One, it will tend to surround the particles, surround each particle, and in so doing separate the particles microscopically from each other. And at the same time there would be development of what's called a pressure drop, where you have higher pressure -- that is, gas pressure -- at one point, lower gas pressure at another point, and so you have what's called a delta P or a pressure drop across that bed of particles. And the combination of surrounding gas around the particles and the pressure drop thereby changes the behavior of that mass of particles.

Q (BY MR. ROSE) Can paste be fluidized?

MR. WERNER: Objection to form and scope.

A Given that paste is not a well-defined term, it seems to me possible, although unlikely, that you could fluidize a paste, but it is possible.

Q (BY MR. ROSE) And why would it be unlikely?

MR. WERNER: Objection to form and scope.

A It would be unlikely because of the cohesiveness of most pastes, that it's difficult to separate individual particles from each other and

thereby allow the gas to surround the particles. And furthermore the -- because of the cohesiveness of the paste, while it's possible to establish a pressure drop across a paste, it's not going to have the same effect as it would if it were a more free-flowing material.

Q (BY MR. ROSE) And I'd like to go back to your declaration that's Exhibit 1044. And on page 4, paragraph 13, you identify materials that Jenike & Johanson has tested. Do you see that?

A Yes.

Q And you identify wet and/or sticky bulk materials such as corn stover and others. Is corn stover a paste?

MR. WERNER: Objection to form and scope, and incomplete.

A I don't have a recollection of that.

Q (BY MR. ROSE) Can you tell me what corn stover is?

A It's some form of refuse from a stalk of corn, but I don't know specifically.

Q Wood chips are not paste, are they?

A No.

Q What about cellulose acetate?

A It's probably not a paste.

Q And what about ceiling tile scrap from a wet scrubber?
A I would characterize that as a paste or a sludge.
Q Or a sludge. And what -- Can you describe what ceiling tile scrap from a wet scrubber is?
A I don't know that I can do it justice. It's basically a refuse material in a plant that is producing ceiling tiles. There is a so-called scrubber, which is used to remove particulate materials so it doesn't get into the environment. In this case it's a wet scrubber as opposed to a dry scrubber, so the material that is collected on that scrubber would be the ceiling tile scrap.
Q So it says a wet scrubber. Is water used to scrub it?
A Not necessarily. It's some liquid. Probably water, but some liquid.
Q Have you heard use of the term dense phase or dense phase conveyance?
A Yes.
Q What is that?
A Dense phase is understood to be the opposite of dilute phase, in that it's basically nonsuspension conveying of particles.

Q So dilute phase is suspension conveying of particles?
A Yes.
Q Is that what you were describing regarding fluidizing agent, when the air particles surround the individual solid particles?
A That's not what I was thinking of in response to that question, but I suppose you could consider it in that fashion.
Q Okay. That's what I'm trying to understand, is what is suspension conveying?
A Suspension conveying is a form of pneumatic conveying in which the individual particles are suspended within the pipeline. There's no -- And so you have individual particles separate from each other, whereas dilute phase, those particles drop out of suspension, and now you have particles in contact with each other, either at the bottom of the pipeline, or perhaps, in some cases, actually encompassing the entire diameter of the pipe.
Q So in dense phase conveyance the particles are suspended by the air; is that correct?
MR. WERNER: Objection to form.
A No.

Q (BY MR. ROSE) Okay. I'm getting backwards then. In suspension conveying the solid particles are surrounded by the air and therefore they are suspended. Is that dense phase or is that dilute phase?

MR. WERNER: Objection to form.

A You're confusing, with all due respect, the matter just a little bit. In both dilute phase and dense phase you could have air around the particles. In fact, just in a bunch of particles here on the table, there's going to be air surrounding the particles. The difference between the two is, in dilute phase conveying, the air velocity is such that the particles remain suspended in the airstream, so they are separate from each other. They're not dropping out of suspension onto the bottom of the pipe, if it's a horizontal pipe.

Whereas in dense phase conveying the velocity is lower, air velocity is lower, to the point where the particles drop out of suspension and there is either what's called a moving bed of particles on the bottom of the pipe, if it's a horizontal pipe, or a condition called plug flow dense phase, where you have actually an accumulation of particles that occupy the entire diameter of the

pipe itself.

Q (BY MR. ROSE) So is there some way that the volume -- the fraction of solid to air is used to define dense phase and dilute phase?

A Yes.

Q Okay. Can you describe that for me?

A One uses the -- The common term is solids loading ratio, which is defined as the mass of solids to the mass of air, and so in dilute phase conveying, that ratio typically ranges from 0 up to roughly 15. Whereas with dense phase conveying, it's higher than 15, typically 25 to 100 to 150, and any -- quite a wide range, but those are basically the regions within which dilute phase stops and dense phase begins.

Q Okay. So if I'm understanding correctly, if your ratio of the mass of solids to the mass of air is from 0 to 15, that would be considered dilute phase?

MR. WERNER: Objection to the form and scope.

A That's -- that's generally the range over which dilute phase occurs, but, again, dilute phase is defined by suspension conveying of the material. So that's -- it's, again -- Well, I don't know if I

can define it any better than that.

Q (BY MR. ROSE) Okay. Are you familiar with the term bridging?

A Yes.

Q What does that mean?

A Bridging, as used in this field of bulk solids technology, refers to a condition in which a stable arch or dome -- those terms, arch, dome or bridge used interchangeably -- but basically a stable flow obstruction -- or a stable obstruction to flow occurs, usually at the narrowest cross-section of a container.

Q Is that something that would occur during dense phase conveyance?

MR. WERNER: Objection to form.

A I guess I could answer your question a couple of ways. First of all, if bridging occurs, there won't be any conveying, whether it's dilute or dense. The material won't move out of the container that is a part of the dense phase conveying system. And, second, as I alluded to just a moment ago, it's a condition that would occur in the container upstream of the equipment. So it could be a bin, a silo, a hopper, a blow tank, any number of storage vessels in which bridging could occur, and if it

does occur there's no flow of the material and hence no conveying.

Q (BY MR. ROSE) That's something that would occur before the material gets to the pneumatic conveyor?

A Yes.

Q We talked a little bit about the term thixotropic or thixotropy. Are pastes thixotropic, in your view?

MR. WERNER: Objection to form and scope.

A They most likely are, yes.

Q (BY MR. ROSE) And why do you say that?

MR. WERNER: Objection to form and scope.

A In my experience, most pastes and sludges change their property as they are -- as they are acted upon, such as stirring in a container.

Q (BY MR. ROSE) So as a paste sits and is not acted upon, does it set up or congeal? Is that what happens?

MR. WERNER: Objection to form.

A That's one of the things that can happen, yes.

Q (BY MR. ROSE) Okay. And then by causing some movement such as by stirring or shaking, that congealing can be, I guess, broken up?

MR. WERNER: Objection to form. Scope.
A It can be, yes.
Q (BY MR. ROSE) And do pastes -- We talked about bridging. Do pastes have an issue with bridging?
MR. WERNER: Objection to form.
A Very often they do, yes.
Q (BY MR. ROSE) Pastes are not particulate solids; is that correct?
MR. WERNER: Objection to form.
A Pastes -- A paste is a combination of particles and a liquid of some sort, whether it be water, oil, or some other liquid. So there are particulates within the paste, but there's also a liquid phase as part of that.
Q (BY MR. ROSE) Are drill cuttings thixotropic?
MR. WERNER: Objection to form. Incomplete.
A They could be, yes. They are a paste, in my opinion, or a sludge, so they could be thixotropic, yes.
Q (BY MR. ROSE) What are the shear stress characteristics of a paste?
MR. WERNER: Objection to form and scope.

A Again, the material is not a well-defined term, or the term paste is not well-defined, so it's -- The response of a paste to shearing could vary considerably. It could be a material where deformation occurs relatively easily, and, for example, in pouring from a container, the material requires little stress in order for movement to occur, or it could be very non-free flowing and have difficulty in being poured from a container or reactive to stress.

Q (BY MR. ROSE) Are drill cuttings the same as drilling mud?

A My understanding is that the drill cuttings very often are mixed with drilling mud but that the two are different from each other. And as I understand the technology on an oil rig, one attempts to separate, as much as possible, the drill cuttings from the drilling mud so that the mud can be reused, whereas the drill cuttings need to be disposed of.

Q Is barite the same as drilling mud?

MR. WERNER: Objection to scope.

A I would characterize barite as a potential component of drill cuttings but not of the drilling mud itself.

Q (BY MR. ROSE) What about water? Can water be the same as drilling mud?

MR. WERNER: Objection to form and scope.

A Again, I would -- I'm of the opinion that water could be and often is a component of drilling mud and also a component of drill cuttings.

Q (BY MR. ROSE) You mentioned being on the oil rig. Have you ever been on an oil rig?

A No.

Q Have you ever seen actual drill cuttings?

MR. WERNER: Objection to form.

A I have seen photos and videos of examples of drill cuttings, yes.

Q (BY MR. ROSE) But not the actual physical cuttings themselves?

MR. WERNER: Objection to form.

A I've not touched and felt drill cuttings, no.

Q (BY MR. ROSE) Have you ever done any testing of drill cuttings?

A I have not personally. I don't believe my firm has, either.

Q Have you witnessed cuttings coming off of a shale shaker?

MR. WERNER: Objection to form.

A I've referenced in my declaration two videos that show examples of drill cuttings.

Q (BY MR. ROSE) In preparing your and coming to your opinions, did you interview anybody who had been on an oil rig or worked firsthand with drill cuttings?

A Not that I recall, no.

Q Can you tell me what, to your knowledge, makes up -- make up drill cuttings?

A My understanding of drill cuttings is that it is the refuse that is brought up with the drilling mud as drilling on an oil rig, so basically it's the -- whatever the particulate matter of the earth, if we call it that, under the ocean bed or constitutes the ocean bed, whatever that material might be, shale, limestone, any number of materials that are brought up with the drilling mud.

Q So just to make sure I'm understanding correctly, the drill is going into the earth and there's drilling mud. What's the purpose of the drilling mud?

A Basically to lubricate the drill.

Q Okay. And then the drilling mud is brought back up, along with other materials?

A Yes.

Q And those materials are the earth?
A Yes.
Q Okay. So there's drilling mud and earth coming up. Is there anything else that comes up in that material?
A I suppose it's possible that there could be some metal particles if there's any wear of the drill itself. But in most cases, I would believe the preponderance of the material would be earth particles.
Q And the drilling mud?
A And the drilling mud and any water or oil that comes as part of that.
Q And then that would be in the form of a slurry?
MR. WERNER: Objection to form and scope.
A I believe as it would come up from the drilling rig, it could be in the form of a slurry, yes.
Q (BY MR. ROSE) Okay. Then what happens to that material next?
MR. WERNER: Objection to form.
A It's -- As much as possible, the drilling mud is separated from the drill cuttings, and the drilling mud is then reused, and the cuttings are

then disposed of.

Q (BY MR. ROSE) So then the drill cuttings and the drilling mud are separated?

MR. WERNER: Objection to form.

A An attempt is made to separate, as much as possible, the two, yes.

Q (BY MR. ROSE) Okay. And how is that done?

MR. WERNER: Objection to form. There's 18,000 offshore oil rigs in the world or something. This is a little vague.

Q (BY MR. ROSE) I mean, to your knowledge.

A I don't know all the ways that it's done. I would think there's some sort of a screening operation, typically, but there could be a number of ways that that separation occurs.

Q Is centrifuge one of them?

A It could be. Again, I don't know all of the ways that separation occurs.

Q And you said that you saw video of a shaker?

A I saw video of drill cuttings that I believe had come from a shaker.

Q Okay. Just so we're clear --

MR. ROSE: 1037.

(Previously Marked Deposition Exhibit Number 1037 introduced to the witness.)

Q (BY MR. ROSE) I've just handed you what has been identified as Exhibit 1037. Can you describe what that is?

A Exhibit 1037 is, as I understand it, a still shot from one of the videos that I referenced in my declaration.

Q And the brown material, what's that?

A That's the drill cuttings.

Q Okay. What is the white thing in the bottom?

A I believe it's a nozzle, but you'd have to look at the video to be sure.

Q Okay.

MR. WERNER: Could you describe what you're identifying as the white thing?

MR. ROSE: To the left of -- it looks like to be a timestamp. It says 7/11/2000, 1506, and then there is something that appears to be white and silver to the left of that.

MR. WERNER: Thank you.

(Previously Marked Deposition Exhibit Number 1038 introduced to the witness.)

Q (BY MR. ROSE) You now have before you

what was marked as Exhibit 1038. Can you describe for me what is shown in this exhibit?

A This is similar to 1037, in that, as I recall, this is a still shot from one of the videos that I've referenced in my declaration showing drill cuttings, an example of drill cuttings.

Q What's the container that the drill cuttings are in?

A It appears to me from this still -- And I'd like to refer to the video itself to be certain, but it would appear to me that it's some sort of a hopper configuration, a conical hopper section.

Q And is this depicting the cuttings flowing into the hopper?

A That's what it appears to me to be, yes.

(Previously Marked Deposition Exhibit Number 1039 introduced to the witness.)

Q (BY MR. ROSE) And I've now handed you Exhibit 1039. Can you tell me what you see there?

A Again, this is similar to the other two, in that I believe this is a still from one of the videos that I referenced in my declaration, and this is showing drill cuttings in a drum, a steel drum, and there is a spoon or spatula that is at the top center of this. There appears to be somebody just

standing behind that spoon or spatula.

Q Okay. Now, the cuttings that we're looking at here in Exhibit 1039, are those with the drilling mud already removed or is that before the drilling mud gets removed?

A My recollection is that this is after as much mud has been removed as was possible on this particular rig.

Q And so this would qualify as a paste?

A Yes.

Q Do the drill cuttings, do they have a particular particle size?

MR. WERNER: Objection.

Q (BY MR. ROSE) I'm talking in general, not just in the picture.

MR. WERNER: Object to form.

Q (BY MR. ROSE) To your knowledge do the drill cuttings -- What are the particle sizes?

A Well, as I testified earlier, Mr. Rose, drill cuttings, as I understand the term, involve a mixture of particles and some liquid. Could be oil, could be water, some other liquid. And the particles could vary in size and shape, depending on both the formation through which the drill is cutting the material as well as the operation of the

drill itself, so there's no defined size or size range.

Q Okay. And there's no air in between the particles in the drill cuttings; is that correct?

MR. WERNER: Objection to form.

A There's no air in the drill cuttings that are shown in these photographs, no.

Q (BY MR. ROSE) Right. And if left to sit will the liquid separate from the solids in the drill cuttings?

MR. WERNER: Objection to form.

A Typically it would, but it doesn't have to.

Q (BY MR. ROSE) So you could decant off the liquid and be left with a dry solid?

A No. I wouldn't describe it that way.

Q So there would always be some liquid that would be holding the particles together?

MR. WERNER: Objection to form. This is a boundless hypothetical.

A I would expect that there's always going to be some liquid in contact with the particles, whether some of that liquid separates or not.

Q (BY MR. ROSE) To the extent there's solids and there are liquids, those solids are in a

suspension of whatever amount of liquid there is?
MR. WERNER: Objection to form.
A Suspension is perhaps not the correct term. I would say that the particles are surrounded by a liquid.
Q (BY MR. ROSE) And just so I'm clear, you didn't do any testing or modeling with the drill cuttings to measure the particle size; is that correct?
MR. WERNER: Objection to form.
A As I testified, I didn't actually look at or receive a sample of drill cuttings, no.
Q (BY MR. ROSE) Okay. Would drill cuttings be characterized as Newtonian or non-Newtonian materials?
A Non-Newtonian.
MR. WERNER: Objection to scope.
Q (BY MR. ROSE) And drill cuttings won't flow under their own weight, will they?
MR. WERNER: Objection to form and scope.
A They can.
Q (BY MR. ROSE) Okay. But not always? Well, strike that.
There are -- Some drill cuttings can flow under their own weight and some don't.

MR. WERNER: Objection to the form of the question and foundation.

Q (BY MR. ROSE) Is that a fair characterization?

A Given that drill cuttings is such a broad term, I would expect that there are conditions in which drill cuttings would flow under their own weight and other conditions where they would not.

Q Okay. In practice, to your knowledge, when the materials come up from the drill that include both the drill cuttings and the drill mud, there's always at least some form of a step taken to try to separate, as much as possible, the drilling mud from the cuttings. Is that your understanding?

MR. WERNER: Objection to form, scope and foundation.

A That is my understanding, yes.

Q (BY MR. ROSE) And so if one of those methods of separation is the use of a shaker to vibrate the cuttings, having been shaken and moving from the vibration, would those cuttings flow more freely due to their thixotropic properties?

MR. WERNER: Objection to form and foundation and scope.

A No. I would think just the opposite.

They probably don't flow as readily because of the removal of the mud.

Q (BY MR. ROSE) Comparing the -- I understand the removal of the mud would make them flow less, but my question is comparing drill cuttings that have been shaken in a shaker compared to drill cuttings that have not been shaken and have just sat after the mud is removed. The cuttings that have been shaken would move more freely than those that have not been shaken due to their thixotropic properties; is that right?

MR. WERNER: Objection to form, scope and foundation.

A There's going to be a time-dependent behavior to the material, so I would expect that in the process of being shaken, that the properties, as a result of that shaking action, are going to be different than if that shaken material is then allowed to sit for a period of time.

Q (BY MR. ROSE) All right. After it sits for a period of time, it's not going to flow as freely as right after it had been shaked. Is that a fair characterization?

MR. WERNER: Objection to form. Incomplete. Foundation.

A It's difficult to make absolute statements, given that drill cuttings is such an undefined term, but in general I would say my answer to your question is yes.

Q (BY MR. ROSE) Are you familiar with the term or the concept of localization?

MR. WERNER: Objection to form and scope.

A Could you be -- Can you elaborate on that a little?

Q (BY MR. ROSE) Yeah. The flow or the characteristics can be nonuniform; for example, after the shaking, as the cuttings are setting up, some areas may still have better flow than other areas during the process of it setting up or congealing?

MR. WERNER: Object to form and assumes facts.

A I would expect that that condition could occur, yes, given that we're dealing with a nonhomogeneous material.

MR. ROSE: Now is probably a good time for a break.

(Whereupon, the proceedings were in recess at 11:05 a.m. and subsequently reconvened at 11:16 a.m., and the following proceedings were

entered of record:)

Q (BY MR. ROSE) Dr. Carson, I wanted to follow up on one thing that you had said just before the break. You had mentioned -- We were talking about the drill cuttings. You said, given that we're dealing with a nonhomogeneous material. What did you mean by a nonhomogeneous material?

A What I mean by that is, it's a material that can have extremely variable constituents, extremely variable properties, depending on the material below the seabed or the ocean bed or the riverbed, whatever, where the drilling is taking place, what that material is, how the drill operates, so it's a material that is extremely variable in both its appearance, its condition, its properties.

Q Okay. I want to go back now and talk about granular materials as opposed to pastes. Am I understanding correctly that granular material, it does contain air for flow, such as in dense phase or dilute phase?

MR. WERNER: Objection to form.

A I wouldn't define it that way.

Q (BY MR. ROSE) How would you define it?

A Well, as I've testified earlier, Mr. Rose,

I think the term granular material might be misconstrued or is misconstrued by some people. I prefer the term bulk material or bulk solid.

Q Okay.

A A bulk solid, as I testified previously, consists of discrete solid particles that are then caused to move, to flow, whether it be in a container -- from a container to some other container or process, or to move via a feeding or conveying device, whether it be pneumatic or mechanical, or it may be moving in a vessel where there's some reaction taking place. Now, those particles, in most cases, are -- in fact, I would say in all cases -- are surrounded by some -- Let me back up. Strike that.

Those particles, in most cases, have a gas, typically air, that is either within the particle itself or more often surrounding the particle. There often is some liquid -- typically water, but, again, could be oil or any other type of liquid -- that is either within the particles or on the surface of the particles or in some cases within the void space between the particles. So the term bulk solid encompasses a very wide range of conditions.

Q Within the broad scope of the term bulk solid, as you've used it, is there some substantive bulk solids that would include such things that are significantly smaller than this table, such as sand or ash?

A Yes. As I testified earlier, bulk solids vary, anything from submicron powders to particles of the size of this table.

Q Right. What would you call those, the smaller ones that are submicron or up to the sand or something along those lines, as opposed to a table? What would you call that?

A The term powder is often used to describe particles. This is not -- again, this is not a strict definition, certainly not a universally accepted definition. But typically the term powder is used to refer to particles that are less than around a hundred microns in size.

Q Okay. What about something the size of wood chips that you identified in paragraph 13? Certainly much smaller than the table. That wouldn't be considered a powder, would it?

A No. It would be considered -- again, all of -- Everything from submicron to this table is considered, in my opinion, and generally accepted,

as a bulk solid, and there's one extreme on the lower end of the particle size range, which is typically referred to as a powder, and it's a subset of a bulk solid. From that point on up, there's really no universal term that's used to describe that bulk solid.

Q You had said in paragraph 13 that Jenike & Johanson had tested pneumatic conveying of materials. You identified powders, pellets and granular bulk solids. Again, does the term granular give some indication as to the size of the particles?

A To some people it does. Again, it's a term of art that connotes something larger than a powder, but there's no strict definition of where a powder stops and a granular bulk solid begins.

Q But in those instances for powders, pellets and granular bulk solids, when those were conveyed they would be surrounded by air?

MR. WERNER: Objection to form. Foundation.

A In most cases that's true, but it's not exclusive.

Q (BY MR. ROSE) And in those cases of the powders, pellets and granular solids, those

materials are not thixotropic; is that correct?

MR. WERNER: Objection to form and scope.

A Again, it's difficult to make generalities in this field. I would say in most cases the answer is no, but I'm thinking of tar sands as an example of a bulk solid that is also thixotropic.

Q (BY MR. ROSE) What are tar sands? I'm not familiar with that term.

A The term tar sands or oil sands is a formation, principally, in Alberta, Canada, or there are other parts of the world that have this, but it's basically an oil-rich formation that -- in which one separates the oil from the refuse and sold on the open market.

Q I want to turn and talk briefly about your definition of a person of ordinary skill in the art. And I'm on Exhibit 1044 at paragraph 29. You identify the person of ordinary skill as a person with a bachelor's degree in science or engineering, such as mechanical, industrial or chemical engineering, along with five years of experience in the design of systems for the handling of bulk solid and fluid materials, including through the use of pneumatic conveyance.

Do you see that?

A I do see it. You left out two words in two occasions here. I said at least a bachelor's degree and at least five years experience.

Q On what do you base that conclusion? How did you come up with those terms?

A I don't recall how I arrived at that particular wording. It could have been in discussion with my colleagues or attorneys here at this firm, but it's my best description of a person that I would consider to have ordinary skill in the art.

Q And the other alternative, I think you said, is a person who had a graduate degree, a master or a PhD in an engineering or related discipline. She or he would have at least three years of experience in the design of systems for handling and transfer of bulk solid fluid materials, including pneumatic conveyance.

Do you see that?

A Yes.

Q And where did you come up with that conclusion?

A My answer would be the same as my previous one. I don't recall.

Q Neither of your definitions requires that

the person of skill have any experience on a drilling rig; is that correct?

A That's correct.

Q Or any experience in conveying drill cuttings?

A That's correct.

Q Why is that?

A Because, in my opinion, it's not necessary for a person to have experience on an oil rig, because it's simply another location where a pneumatic conveying system could be used and is used as far as these patents are concerned. And, similarly, it is not necessary for a person to have experience with drill cuttings, because, again, drill cuttings is not a well-defined term. It's basically a paste or a sludge that is being processed and conveyed either on a drilling rig or from a drilling rig to a boat or a ship.

So as I see it, this is basic pneumatic conveying 101, that you're taking a material, you are placing that material in a blow tank, you're pressurizing that blow tank and you're conveying material. Whether that system is on an oil rig or on an industrial plant, whether the material is drill cuttings or some other non-free flowing

material, to me, those are immaterial. And one should be able to take from the literature, from other patents, from books and publications, and use that basic pneumatic conveying 101 technology to design and operate such a system.

Q I'd like to turn to page 41 of your declaration, Exhibit 1044. And there, beginning with paragraph 91, you begin a discussion of the Laster reference. Do you see that?

A Yes.

Q And there is a statement to Laster teaching the use of a pneumatic pumping apparatus for pumping drilling mud and like thick, difficult to pump slurry fluids that can be used on drilling rigs. And then next you say, Laster describes drilling mud as a thick, viscous fluid that is quite thick and difficult to pump or move when it is used up. And then the next sentence you talk about Laster directed to drilling mud that had been used to the point that it has become too polluted or too filthy to reclaim. Then you say, one of ordinary skill would understand this to be indicating that drilling mud has been so contaminated with drill cuttings that it can no longer be used for the drilling operations and must be removed from the

site.

How would somebody who's not had any experience with drill cuttings or on a drilling rig understand that what is being said in Laster is that the mud has been so contaminated with drill cuttings?

A I think that a person of ordinary skill could make that determination by going to the literature and reading whatever the patents or various publications about operation of a drilling -- of a driller -- oil drilling rig.

Q But you didn't identify anything other than Laster in order for the person of ordinary skill to come to that conclusion in this case; is that right?

A That's right.

Q Now, we've heard the term used today non-free flowing. Isn't non-free flowing the opposite of free-flowing?

MR. WERNER: Objection to form.

A Yes. I would say that non-free flowing is not free-flowing, by definition.

Q (BY MR. ROSE) What I've handed you is the petition regarding the '062 patent, claims 1 through 29. And I'd like to direct your attention to the

bottom of page 11, and here the petitioner is talking about what is free-flowing and cites to a dictionary definition for free-flowing that is, quote, characterized by easy freedom in movement, progression or style.

Do you see that?

A Yes.

Q So non-free flowing is defined in terms of freedom. Emphasis is on the word freedom, correct?

MR. WERNER: Objection to form. Scope.

Q (BY MR. ROSE) I'll hand you another document that was also -- has been previously marked as Exhibit 1043.

(Previously Marked Deposition Exhibit Number 1043 introduced to the witness.)

Q (BY MR. ROSE) And that dictionary definition is found here for free-flowing, characterized by easy freedom in government, progression or style -- in movement, progression or style. Sorry. And, again, so here the definition relied on by the petitioner defines non-free flowing in terms of freedom, correct?

MR. WERNER: Objection to form and scope.

A No. I wouldn't say that is correct. If I -- These are dictionary definitions, as stated in

this petition, and just prior to that I indicate, on the second line of this paragraph, the specification does not provide any guidance concerning how to differentiate between these two categories, namely free-flowing versus non-free flowing. Further -- And I'm quoting now. Further, as stated in Exhibit 1016, the material itself cannot be characterized as non-free flowing, close quotes. Continue: In discussing the flowability of powders around the time that the alleged invention of the '062 patent, Exhibit 1016, states, quote, flow behavior is multi-dimensional, close quote, and depends on many characteristics beyond the material itself, such that, quote, no one test could ever quantify flowability, close quotes.

Q (BY MR. ROSE) But in the petition, at the top of page 12, petitioner refers to something that is non-free flowing if it does not freely move, i.e., it exhibits some resistance to flow.

So is it your opinion that something is non-free flowing if it exhibits some resistance to flow?

A Yes.

Q Any resistance to flow?

MR. WERNER: Objection to form.

A No. I wouldn't go that far. Again, it's not a very well -- there's not a strict bound between something that is free-flowing and non-free flowing. There's always going to be some resistance to flow, just in terms of friction of particles against a surface, for example.

Q (BY MR. ROSE) Right. That was sort of where I was going with my next question. Doesn't everything have some resistance to flow?

A Yes.

Q But not everything is non-free flowing. Some things are free-flowing even though they have some resistance to flow?

A Yes. And the point that is made here -- and I make this point in my declaration -- is that one cannot look solely at the material itself but at the system or the container in which that material is placed. And there's an interaction between the two. You can take what most people would consider a free-flowing material, such as dry sand or plastic pellets, and if you put that material in a hopper, and that outlet size is smaller than, say, three or four grains of that material, it won't discharge. In that case you would say the material is non-free flowing because it's not coming out. So it's not

just the material, but it's the system in which that material is being handled that allows one to differentiate, as crudely as is the case, whether the material readily discharges or it does not discharge.

Q We've already discussed, and I think you've already agreed, but correct me if I'm wrong, that when talking about drill cuttings, for example, sometimes the drill cuttings are free-flowing and sometimes they are non-free flowing, correct?

MR. WERNER: Objection to form.

A Again, Mr. Rose, drill cuttings is not a term that, in my opinion, has any particular metes or bounds as to its definition, depending on the subsurface formation, the way that the material -- that the drill is operating, the drilling mud, how much the mud is separated from the cuttings, can have and does have extreme importance in terms of the characteristics of the material. In most cases I would expect that drill mud, drilling mud is non-free flowing, but I could see a situation where --

Q (BY MR. ROSE) You mean drill cuttings?

A Drill cuttings. Excuse me. Thank you for the clarification. Where drill cuttings are

non-free flowing, but in some cases they could be free-flowing.

Q And isn't the term non-free flowing used in your field to mean -- at least sometimes to mean does not generally flow freely by gravitational force?

A That's a term that's often used, yes.

Q And in your declaration, when you talk about non-free flowing at paragraph 41, you recite to Exhibit 1016. That's on page 17. I'm sorry. Page 17, paragraph 41, and the citation to Exhibit 1016. If I got that wrong I apologize.

(Previously Marked Deposition Exhibit Number 1016 introduced to the witness.)

Q (BY MR. ROSE) And I'll just hand you Exhibit 1016. That's an article about powder flowability, correct?

A Yes.

Q And drill cuttings are not powder, correct?

MR. WERNER: Objection to the form and foundation.

A I would say that, as a general rule, drill cuttings are not powder, but I would point out to you in this particular article, which is written by

two engineers in my company who work for me and have for years, this particular article was written for Pharmaceutical Technology magazine. And so in the pharmaceutical world, most of the materials, bulk solids that are handled, are less than a hundred microns in size, and hence the term powder is used very often to describe that material.

Having said that, in my opinion, the description of flowability and how the system is as important as the material itself in defining flowability applies, whether it be a powder or any other type of bulk solid.

Q (BY MR. ROSE) And so at page 62 of Exhibit 1016, the author or authors state -- and I'm on the first paragraph towards the top with the sentence beginning with therefore. Therefore, a more accurate definition of powder flowability is the ability of powder to flow in a desired manner in a specific piece of equipment.

Is that right?

A Yes.

Q So in that instance, the term of free-flowing is tied to the piece of equipment or the particular container?

A Yes. As I said earlier, it's a

combination of the material, the bulk solid and the container, or the system in which you're trying to get that material to move. And the following sentence just reinforces what I said earlier about taking the material, such as dry sand or plastic pellets. It's only free-flowing if the container opening is such that it allows the material to discharge.

Q If you will, turn to page 74 of Exhibit 1016. And in the middle column, the last full paragraph, beginning with the word because. Do you see where I'm referring, in the middle column?

A Which paragraph?

Q Page 74. I'm sorry.

A And which page?

Q The last full paragraph starts with the word because.

A 74. Okay.

Q And six lines down in that paragraph there's a sentence starting with, if the powder.

A Yes.

Q If the powder is sufficiently free flowing and dense, gravity-driven flow into the rolls may be possible.

Do you see that?

A Yes.
Q And further down, if the powder is poor flowing so that compaction is required to improve flow (as is often the case), then gravity-driven feed into the rolls may be possible. So free-flowing --
A Excuse me. May be impossible.
Q Impossible. That's right. I read that incorrectly. So free-flowing is being described here in terms of whether gravity-driven flow is possible, correct?
MR. WERNER: Objection to form.
A In this particular instance, this whole section, as you can see, near the top of the first column on this page, this whole section has to do with compaction processes.
Q (BY MR. ROSE) So it is possible to define non-free flowing in terms of gravity.
MR. WERNER: Objection to form.
Q (BY MR. ROSE) Is that fair?
A It is possible, yes.
Q I want to turn you back to your Exhibit 1044, your declaration. And I'm looking at the -- in paragraph 43, just following your citation to the two YouTube videos.

A Yes.
Q There's a sentence that says, while I do not believe the boundaries of the term paste could be ascertained by those of ordinary skill in the art with any reasonable certainty, I believe the materials shown in this video and photographs -- photographs would be considered by those of ordinary skill in the art to qualify as examples of a paste form of drill cuttings.
You use the term paste form. Is that because there are other forms of drill cuttings that aren't necessarily a paste?
A Again, Mr. Rose, as I've testified numerous times here, drill cuttings, in my opinion, are -- refer to a material that could be extremely variable, and while in many cases the material would be considered paste form, in other cases it could be a nonpaste.
Q So isn't it a fair construction of the term non-free flowing drill cuttings to be material generated by the drilling of an oil well containing a mixture of earth and drilling fluid or oil that does not generally flow freely by gravitational force?
MR. WERNER: Objection to form.

A On paragraph 41 I've provided a description of what I believe those of ordinary skill would believe to be the broadest reasonable interpretation of the phrase non-free flowing drill cuttings as used in the patent. And I state here, quote, would cover, quote, a mixture of liquid and earth-extracted material that exhibits some resistance to flow, close quotes.

Q (BY MR. ROSE) We've talked about the use of the term some resistance to flow. All drill cuttings resist -- some resistance to flow, don't they?

MR. WERNER: Objection to form.

A Yes.

Q (BY MR. ROSE) But we've also discussed that there are some drill cuttings that are non-free flowing and some drill cuttings that are free-flowing, correct?

MR. WERNER: Objection to form. Mischaracterizes testimony.

A There are some that are more free-flowing than others.

Q (BY MR. ROSE) All right.

A Again, there's not a sharp demarcation, whether it comes to drill cuttings or any other bulk

solid, between non-free flowing and free-flowing.

Q You will agree with me that there are some drill cuttings that are not non-free flowing?

MR. WERNER: Objection to form and foundation.

A It is -- Given, again, this is such a broad range of materials, I could envision a condition in which the material would be -- the drill cuttings would be more on the free-flowing side as opposed to the non-free flowing side. I would think the majority of the cases, however, we're talking about a non-free flowing material.

Q (BY MR. ROSE) Those materials you just described as being on the more free-flowing side, those would still exhibit some resistance to flow, wouldn't they?

A Yes.

MR. WERNER: Objection to form.

Q (BY MR. ROSE) And so using your definition at the bottom of page 16, paragraph 41, using your definition, those cuttings that you just described as being more on the free-flowing side than on the -- I'm sorry. Yeah. More on the free-flowing than the non-free flowing side, those would still fall under your definition of non-free

flowing drill cuttings; isn't that correct?

MR. WERNER: Objection to form. Incomplete hypothetical.

A Based on the definition I've provided here, yes. Everything's going to have some resistance to flow.

Q (BY MR. ROSE) We talked a little bit earlier today about mass flow -- I believe you mentioned that early on -- based on some work that Dr. Jenike did in the early 1960s. Do you remember our discussion about mass flow?

A Yes.

Q Mass flow appears in several of the claims in these cases; isn't that correct?

A Yes.

Q You did not provide a definition of mass flow, did you, in your declarations?

A I don't recall doing so. I might have.

(Previously Marked Deposition Exhibit Number 1004 introduced to the witness.)

Q (BY MR. ROSE) Go ahead and hand you a copy of Exhibit 1004, which is U.S. Patent 7,186,062. And, for example, if you could turn to column 7 of the '062 patent, claim 9, that claim reads, the method according to claim 8 wherein the

conical hopper portion has a predetermined cone angle, wherein the cone angle enables mass flow of the drill cuttings.

Do you see that?

A Yes.

Q And without going through all the other claims that have mass flow, I'd like to turn your attention to column 2 of the '062 patent, Exhibit 1004. And at column 2, line 53, after the word value -- Do you see where I am?

A Yes.

Q Okay. The patent states, then the flow changes from core flow to so-called mass flow. In the case of mass flow, the material descends as a mass in a uniform way towards the outlet with all the material moving.

Do you see that?

A Yes.

Q Is that a fair definition, a reasonable definition for the term mass flow?

A The only -- In general I would say yes. The only thing that I would disagree with is the word uniform. The key for mass flow is to get all of the material moving, which is the last part of that sentence. If you have a tall cylindrical

vessel, then in the upper portion of that vessel the material will move at a uniform velocity across this cross-section.

In the converging hopper section, typically a cone, at least in terms of these patents are concerned, there's going to be a velocity gradient, such that the material at the center is going to flow faster than the material at the walls. As long as the material is moving, that's considered to be mass flow.

Q And if you will, turn to column 5 of Exhibit 1004. And in particular I'd like to direct you to the sentence beginning at line 39 of column 5. It begins with, due to the conical. Are you there?

A Yes.

Q Okay. The '062 patent states, due to the conical angle of the conical or hopper section 93 being less than a certain value, the material flow out of the container 93 is of the type known as mass flow and results in all of the material exiting uniformly out of the container.

Do you see that?

A Yes.

Q So, again, that's the definition of mass

flow that's used in the '062 patent, correct?
A Yes.
Q And if we can take a look back at Exhibit 1016 that we had out earlier.
MR. WERNER: Which exhibit?
MR. ROSE: 1016.
Q (BY MR. ROSE) And in particular I'm looking at page 64. And there are two diagrams there showing, on the right, mass flow. Do you see that?
A Yes.
Q Would you agree that that's a depiction of mass flow?
A Yes.
Q And in that depiction is the material not flowing uniformly?
MR. WERNER: Objection to form.
A It depends how one defines uniformly. And I'm not certain exactly how Mr. Snowdon was using that term. If one considers uniformly to be the velocity across the cross-section, then at the top of this container, if one were to look at that top surface as it moves downward, it would be uniform in velocity. It would be all moving down vertically and at essentially the same velocity. In the hopper

section, as you can see by the length of the arrows, the material is moving, first of all, at the centerline that's moving down vertically, and whereas at the walls it's moving down parallel to the walls, so that the direction of movement has changed.

And, second, by the length of the arrows, you can see that what is being depicted here is that the velocity at the center is greater than the velocity at the walls, and that's just effect of natural physics. At the centerline there's no resistance to the movement of the particles, whereas at the wall the particles are sliding against a stationary surface, and therefore their velocity is going to be lower. So whether or not one that considers to be uniform or not, I don't know.

But that's -- This is just basic physics of how material flows in a container in which one has a mass flow pattern, as contrasted with funnel flow, or as Mr. Snowdon calls it, core flow, they're one and the same. On the left side of this figure, figure number 2, you can see that there is an indication that you have some moving material. It's moving at the walls at the top of the vessel. But as you get down in the lower half of the cylinder

and into the hopper, there's only a central core that is moving, and the material outside of that core is stagnant.

Q (BY MR. ROSE) Does this mean that the flow is localized?

MR. WERNER: Objection to the form.

A I think that's a reasonable term to use to describe the flow, yes. Localized at least in a portion of the container.

Q (BY MR. ROSE) We talked earlier about granular materials. And without getting back through that whole discussion of, as far as the size of the table. But we talked about in your paragraph 13 where you reference powders, pellets and granular bulk solids, those materials. Can those experience uniform flow in a pneumatic conveyance?

MR. WERNER: Objection to form.

A Now we're talking pneumatic conveyance, and we're talking about uniform flow and pneumatic conveyance. It's very different than what we were just talking about. Do I understand that correctly?

Q (BY MR. ROSE) What's the difference between what we've been talking about and pneumatic conveyance? We've been talking about in terms of the '062 patent.

MR. WERNER: Objection to form.

A Let me understand your question then. When you talk about pneumatic conveyance, are you talking about within the pipeline itself or are you talking in relation to the patent, within the blow tank?

Q (BY MR. ROSE) I'm talking about what's shown in Figure 2 of Exhibit 1016.

A Which has nothing to do with pneumatic conveying.

Q Okay.

A At least as far as the pipe is concerned. It may have to do with the blow tank in the case of these patents, but we're talking -- in Figure 2 of Exhibit 1016, we're talking about a storage container in which there is a mass of particles of some size and shape, and one is looking at what happens as that mass of particles is discharged from that container. And does all of the material move as soon as anything is withdrawn? Mass flow? Or is some of the material stationary while the rest is moving, which is funnel flow, or as Mr. Snowdon calls it, core flow.

Q Well, if in a blow tank it's being -- pneumatic pressure is being applied to, would such

materials as powders, pellets and granular bulk solids experience mass flow?

MR. WERNER: Objection to form. Incomplete.

A They could if, as Mr. Snowdon points out, a critical angle is achieved as far as that design is concerned.

Q (BY MR. ROSE) And does it also require a sufficient separation of the particles?

MR. WERNER: Objection to form.

A No.

Q (BY MR. ROSE) Have you heard of the term rat holes?

A Absolutely.

Q How are those formed?

A Rat holes are formed in funnel flow containers or can form in a funnel flow container. Not all funnel flow containers will exhibit rat-holing, but if you have, in the case of Exhibit 1016, Figure 2, if you have material that is stagnant as material is discharging, then, depending upon the cohesiveness of that material, once that central core of material discharges, the remaining stagnant material is stationary and never discharges. And so you end up, if you look into the

top of that vessel, with a condition as shown in Figure 1 of the same exhibit, where a rat hole forms because of that stagnant material that on its own cannot and does not discharge through the outlet.

Q So is it your understanding and your testimony that Figure 2 in Exhibit 1016, that does not relate to the application of air to solids? Is that what you're saying?

MR. WERNER: Objection to the form.

A I don't understand your question.

Q (BY MR. ROSE) Does that -- Is what's being shown in Figure 2, is it solely showing gravity flow?

MR. WERNER: Objection to form.

A No. As far as this particular publication is concerned, I haven't taken the time to read through line by line of what the authors state here, but for this particular publication, it's probable that they were referring to gravity flow condition. But as Mr. Snowdon explains in the patent, depending upon the material that's being handled and depending upon the configuration that is the cone angle -- and I would also point out the outlet size and the amount of pressure that's being applied -- that it is possible to have a mass flow condition in a blow

tank.

MR. ROSE: I think we're at a good stopping point. It's a little after noon, so lunch break?

MR. WERNER: Okay.

(Whereupon, the proceedings were in recess at 12:05 p.m. and subsequently reconvened at 1:10 p.m., and the following proceedings were entered of record:)

(Previously Marked Deposition Exhibit Number 1006 introduced to the witness.)

Q (BY MR. ROSE) Dr. Carson, I've handed you a document that was previously marked as Exhibit 1006. This is what's sometimes referred to as the Ciaffone reference. Is that how you pronounce it?

A I don't know. It's as good as any.

Q Okay. Are you familiar with this reference?

A I am.

Q Can you walk me through what exactly is being done with this system that's shown in Figure 2?

MR. WERNER: Objection to form.

A So as I understand Figure 2, is that

material is collected in item 40. This has to do with, as I recall, hospital waste and sludge, organic material, skimmings, unwashed grit, unground screenings. So the material is collected there, and then when valve 20 is opened, that material then drops down into what I'll call the blow tank, number 11, and then valve 20 is closed, and the vessel is then pressurized using line 22, and once a particular pressure is reached, then the material is then conveyed through line 29 and goes into an incinerator, which is item 30.

Q And so the material that goes into the container 11, or 19, those are fed in by gravity feed; is that correct?

A I don't recall how it's fed in. It looks from this that it might be gravity fed, yes.

Q And Ciaffone teaches the conveying of solids, right?

MR. WERNER: Objection to the form.

A Well, he calls it waste material. And I enumerated what he says in the first paragraph. So yes, it's various forms of solids, including organic matter. I would imagine this would be liquid of some sort, potentially, mixed in with the material.

Q (BY MR. ROSE) Liquid mixed in with the

solids?
A Yes.
Q And in column 1, beginning at line 70, Ciaffone lists several materials, right?
A Yes.
Q And he includes screenings, grit, sludge cake, skimming, hospital waste, refuse, garbage, bark, plastics and the like, from the collection chamber?
A Yes.
Q And none of those are sludge, correct?
MR. WERNER: Objection to form. Foundation.
A I wouldn't characterize it this way. Indeed he talks about a sludge cake. To me that's sludge.
Q (BY MR. ROSE) What is sludge cake as compared to sludge?
MR. WERNER: Objection to form.
A I don't know the difference. I would take it to be one in the same.
Q (BY MR. ROSE) Are sludge cakes dried sludge?
A Could be, but, again, I don't think it's a well-defined term.

Q Are any of these materials non-free flowing pastes?

MR. WERNER: Objection to form.

A I would say that several of them are -- could be considered non-free flowing paste. Sludge cake, skimmings, hospital waste, garbage. Garbage is probably not a paste, but those first three certainly could be paste.

Q (BY MR. ROSE) The materials are fed into the pressure chamber by gravity feed; isn't that right?

A You asked me that a moment ago. I believe that's the case. I'd have to go through the specification to see for sure, but it looks from Figure 2 that that's the case.

Q There's also an -- The materials are also somewhat aerated, aren't they?

MR. WERNER: Objection to form. Foundation.

A I don't see how you would come to that conclusion.

Q (BY MR. ROSE) If you would, turn to column 3, beginning at line 11. There's a discussion of, thus, the waste is compacted in the ejector.

Wouldn't there need to be some component of air in order for the material to be compacted?

MR. WERNER: Objection to form.

A I'm sorry. Your question again?

Q (BY MR. ROSE) Yes. It says, when the waste is compacted in the ejector.

In order for there to be compaction, doesn't there necessarily need to be some amount of entrained air? Otherwise it would already be compacted.

MR. WERNER: Objection to form.

A I don't follow that at all.

Q (BY MR. ROSE) How is waste compacted if there's no air entrained in it?

A By the application of air pressure to the top of the ejector.

Q And then the materials are then transferred out of the ejector, correct?

A Yes.

Q And then through piping at the bottom?

A Yes.

Q Then it goes up a rigid piping to the top of Figure 2, where you see numeral 31?

A Yes.

Q And then it enters item 30, which is an

incinerator, right?
A Yes.
Q So this is being used to incinerate waste?
A Yes.
Q Okay. And is there any discussion of what the liquid or water content is in the materials of the sludge material you identify?
A I'm sorry. In this patent?
Q Yeah. You said sludge cake. Is there any way to determine how much water, what the liquid content is?
A No.
Q And we don't have any understanding what the air to solid ratio is, correct?
A That's correct.
Q Do you know why Ciaffone refers to compressing the waste in the injector?
A I believe it would be for the same reason as in the Snowdon patents, that air, or in general some gas, is being introduced at the top of the vessel, and that acts as a piston to compact the material that is below the free board space of the vessel.
Q And then when it gets to the incinerator it disperses, correct?

A Yes.
Q Would there necessarily be some air in the material in order for it to disperse?
A No. I wouldn't say in order for it to be dispersed. As it's being dispersed some air would be introduced.
Q And then it's incinerated?
A That's my understanding, yes.
Q Well, taking a look at the materials shown, for example, in Exhibit 1037, the drill cuttings, would those be able to be incinerated in an incinerator?
MR. WERNER: Object to the scope.
A I don't know.
Q (BY MR. ROSE) Or in Exhibit 1039?
A I don't know.
Q But Ciaffone doesn't teach fluidizing the material in the ejector, does it?
A No.
Q Other than the sludge cake, are any of the materials identified in column 1, starting at line 70, would those constitute sludge?
MR. WERNER: Objection to the form.
A As I testified a few moments ago, Mr. Rose, I would expect that it's possible. Again,

these are just words. Hard to know exactly what's being referred to. But skimmings and hospital waste, and I guess I would include refuse, all of those could be sludges. And I would also point out, above this, starting at line 49, it talks about similar problems in the conveyance and disposal of other types of waste, include, for example, skimming and digestive scum and sewage waste, hospital waste, animal waste, refuse, garbage and the like.

Q Right. And it's identifying much the same as it identified starting at 70, going on to wood, bark, sawdust, waste plastics and the like.

A Yes.

Q How would you determine whether any of those materials is a sludge?

MR. WERNER: Objection to form.

A Well, as I stated in my declaration, there's not a universally accepted definition of either a sludge or a paste. It's basically a non-free flowing cohesive material. It usually has some liquid component in addition to particles. Liquid could be water, oil or some other liquid.

Q (BY MR. ROSE) But if it's non-free flowing it wouldn't go into the ejector by gravity, would it?

MR. WERNER: Objection to form.

A It could, depending on the size of pipe 14 and the opening to the ejector.

Q (BY MR. ROSE) Then it would not be non-free flowing, would it?

MR. WERNER: Objection to form, foundation, assumes facts, and mischaracterizes testimony.

A As I testified earlier, Mr. Rose, and as pointed out in my -- by my colleagues in Exhibit 1016, whether the material is free-flowing or non-free flowing depends not only on the material or the container or the vessel in which that material is being handled. So while I could see a situation where the material is able to flow by gravity from vessel 40 through pipe 14 into the ejector 11, that doesn't necessarily mean that the material would flow from the ejector into pipe 26. And so you could have the material that flows in one instance but doesn't flow in another instance, and that's entirely consistent with Exhibit 1016.

Q (BY MR. ROSE) And Ciaffone doesn't make any mention of mass flow, does he?

A I don't recall that he did, no.

(Previously Marked Deposition Exhibit

Number 1007 introduced to the witness.)

Q (BY MR. ROSE) You now have a document that was marked as Exhibit 1007. Do you recognize this?

A I do.

Q What is this?

A This is the so-called Macawber brochure.

Q All right. This is a piece of marketing literature, correct?

A That is correct.

Q And on page -- I don't know that they have page numbers here, but the fifth page.

A Yes.

Q Where it says Macawber Engineering Limited at the top?

A Yes.

Q What is that unit that's shown in the top middle set of drawings?

A That is Macawber's so-called Denseveyor device, and it has the Macawber dome valve at the top.

Q And the air intake in the Macawber Denseveyor is on the side of the tank; isn't that right?

A It's shown near the top of the cone

section, yes.

Q Why is the air added on the side?

A I do not know.

Q Does that affirm that the air serves as a fluidizing agent inside the tank?

MR. WERNER: Object to the form.

A No, it does not.

Q (BY MR. ROSE) Why not?

A Because if the -- It depends on the amount of material that is placed into the blow tank, but as shown in number 3, if the level is below the inlet nozzle, then the air that's being introduced is simply compacting and pressurizing the material that's below it.

Q And that's different from what's shown in Figure 2?

A That's correct. Figure 2 shows the material being filled into the container such that it goes all the way up to the dome valve, and in that instance there could be -- as the air is introduced, there could be some limited amount of fluidization of the material above the air inlet. And indeed in item 3 and that list to the right of six items talks about air is introduced at a controlled rate to pump the material to its

destination without fluidizing excessively. And I understand that to refer to that material that in item 2 is -- some of that material that's above the air inlet. Once the material is pressurized and it settles, then, in item 3, then there's no fluidization. It's simply driving the material through the vessel.

Q Wouldn't it have already been fluidized by the time you get to drawing 3?

MR. WERNER: Objection to form.

A There could have been some fluidization of the material, some portion of the material above the nozzle in number 2, but by the time it gets to number 3, I would expect that the material, because of the compacting effect of that air pressure, that it would have removed any degree of fluidization the material had.

Q (BY MR. ROSE) The item 3 that you read, it uses the phrase without fluidizing excessively. Do you see that?

A Yes.

Q So by using the word excessively, doesn't that suggest there is fluidization, there's just not too much of it?

MR. WERNER: Object to the form.

Incomplete.

A The way I interpret that wording is that there could be some amount of fluidization occurring during a portion of the cycle, namely in item 2, if the material level is above that of the nozzle. But, again, once the level drops down to what's shown in number 3, I wouldn't expect there to be any fluidization remaining.

Q (BY MR. ROSE) And there's no mention in Exhibit 1007 of using this product to convey pastes, correct?

MR. WERNER: Objection to form.

A I do not see the word paste in this document, but there are many materials that are listed which could be pastes.

Q (BY MR. ROSE) Where do you see those?

A Well, I'm looking on page 2, the first column. It mentions in the second full paragraph, a little over half way down, materials such as ultra fine cohesive powders. It mentions a couple lines below that high moisture content materials, chemicals and food stuffs could be pastes. It goes on to say, quote, the list is endless. In fact, at Macawber we call it our A to Z of material handling, close quotes. I see in item 3 in the middle column,

quote, whatever the matter, Macawber can handle it.
So that implies to me that a paste or a sludge could be handled with this system. And I see on page 3 in the second column it talks about the company's installation of its Denseveyor system, diverse products. Minced dog food in this condition could be a paste. Detergent fines I suppose could be a paste. So while the word paste itself is not here, it's apparent to me that Macawber is promoting their Denseveyor as a system that can handle virtually any type of material, including a paste or a sludge.

Q Right. But it never says we can handle every material including a paste or a sludge. It just says our product can handle everything.

MR. WERNER: Object to the form.

A Basically that's what it says.

Q (BY MR. ROSE) And this is a promotional advertisement, isn't it?

MR. WERNER: Object to the form.

A Promotional brochure.

Q (BY MR. ROSE) Wouldn't that fall under the category of puffery?

MR. WERNER: Objection to the extent it calls for a legal conclusion.

A I don't know how I can answer that. It's a promotional brochure. One would expect that Macawber, being a reputable company, would not exaggerate their capabilities if they're not able to meet that.

Q (BY MR. ROSE) Well, when they say whatever the matter, Macawber can handle it, surely they did not test everything under the sun.

MR. WERNER: Objection to form.

A By definition, no, they did not, but they certainly give no indication that there's any material they've come up against that they couldn't handle.

Q (BY MR. ROSE) They don't say that they can't handle paste, but they also don't specifically identify paste as something that can be handled, correct?

A That's true.

Q And then on -- I guess it's page 5, the green page, the column to the right, that second paragraph, they talk about excellent reliability record on a wide variety of materials, cohesive powders, granular products up to 5 millimeters, and certain high moisture content substances can be transported. Are any of those a paste?

MR. WERNER: Objection to form.

A They could be. Certain high moisture content substances. This refers to their Controlveyor, which is a different technology or an extension of their Denseveyor system, as I understand it.

Q (BY MR. ROSE) I'm referring now to the page that had the drawing of the Denseveyor.

MR. WERNER: Which one? There's a couple.

MR. ROSE: I'm sorry. They don't number all their pages, so let me just count from the beginning. One, two -- Five.

MR. WERNER: Macawber Engineering Limited?

MR. ROSE: Macawber Engineering Limited.

A Excuse me just a second. The previous page we were talking about would have been page 4.

Q (BY MR. ROSE) Page 5 at the bottom. So you're right. The previous one would have been 4.

Now on the page that's entitled Macawber Engineering Limited, on the left-hand column the document states, material is transferred from totally enclosed plumb lines at low velocity by the Denseveyor. The fully automatic system is designed to incorporate only one moving part, the dome valve. Macawber used an air ratio of 25 to 1, which ensures

minimal material velocity and degeneration.

Isn't using an air ratio of 25 to 1, doesn't that mean that it's fluidizing?

A No.

Q What does that mean, then, when you're using an air ratio of 25 to 1?

A That, to me, is referring to a solids loading ratio, which as I testified earlier, if it's above 20 to 25 -- and typically 25 would be a lower limit -- then it's dense phase conveying.

Q Then so -- Okay. When you say an air ratio of 25 to 1, which is the air, the 25 or the 1?

A The air is the 1.

Q Okay. And the 25 is the what?

A Is the product, the material.

Q And in a paste, though, there is no air, correct?

MR. WERNER: Objection to form.

A There is no air within the paste itself, but in the application of a blow tank, such as shown here in this exhibit, one could and would introduce air at the top of the vessel with the paste inside, and in so doing use that piston effect of driving that paste through the pipe at the bottom.

Q (BY MR. ROSE) Is a paste a bulk granular

solid?

MR. WERNER: Objection to form.

A As I've testified earlier, Mr. Rose, a paste is not a well-defined term, nor is the term sludge well-defined. In the world of bulk solids one generally thinks of dry, free-flowing bulk solids and powders on one extreme and a liquid on the other, and there's a wide range of materials and characteristics in between, and over a good portion of that in-between range is material that has some solids characteristics, some liquid characteristics, and that's a paste or a sludge.

Q (BY MR. ROSE) Okay. So in your view is a paste a bulk granular solid?

MR. WERNER: Objection to form. Asked and answered.

A It's a material that consists of solid particles in combination with a liquid, and it has certain characteristics of a bulk solid, it has certain characteristics of a liquid, so I can't say that it's definitely one or the other; it's in between.

Q (BY MR. ROSE) So you'd have no opinion one way or the other whether a paste is a bulk granular solid?

MR. WERNER: Objection to form. Mischaracterizes testimony.

A I don't know that I can testify any more clear than I have.

(Previously Marked Deposition Exhibit Number 1008 introduced to the witness.)

Q (BY MR. ROSE) I've given you what's been marked as Exhibit 1008. Do you recognize this exhibit?

A I do.

Q What is this?

A This is the so-called Macawber Coal Ships exhibit. At least a portion of it is.

Q And you're referring to the portion starting at page 21?

A Yes.

Q Is this the project that you worked on with Mr. Snowdon?

A The project that I worked on with Mr. Snowdon is referenced on page 24, under the title coal cargo provides fuel.

Q And the portion that you worked on was not the pneumatic conveying portion of that project, right?

A That's what I already testified. Yes.

Q Okay. Turning back now to page 21, there is a statement starting at the top of the far right column starting with the. It says, the ash content may also be very high. In some cases it may be represented by clays, which, when coupled with high moisture contents, form a sticky, difficult-to-handle material that blocks the pneumatic pipeline.

Do you see that?

A Yes.

Q What is the "it" that's being referred to there?

A The ash. The ash content.

Q So the ash may be represented by -- is that clay that contaminates the coal?

A It's -- Clay is one of the noncombustible components of what is called coal. Coal consists of a carbonaceous material, and that obviously can be burned, to some extent, anyway, and then a nonburnable component, which is referred to as ash. So what it's referring to here is that in some cases that ash may have a high content of clay.

Q Okay. So the coal burns but the clay doesn't, and so the result of the coal burning and the clay not, is that what it's referring to there?

A In general my answer is yes. It's just that ash could be more than just clay. It's any nonburnable, noncombustible component. But it's not uncommon for clay to be a major component of ash.

Q Again, referring now to page 22, and there's a reference in the second paragraph, beginning with, the three groups, on the right -- I'm sorry -- on the left-hand column, pneumatic conveying - lean, medium and dense phase.

A Yes.

Q That refers to the ratio of air to the material being conveyed. And then it refers to those ratios there, 100 to 1 and 25 to 1. What are those ratios that are referred to there?

A That's the inverse of the solid loading ratio.

Q So still the solids -- in the 100 to 1 portion, solids are 100 and air is 1?

A No. In this case it's the inverse, so it would be the air is 100 and the solids is 1.

Q And so in that instance is the material fluidized by the air?

MR. WERNER: Objection to form. Incomplete.

A It's not so much fluidized, but there's

sufficient air that the particles remain in suspension, and hence you end up with what is called here a lean phase system. In most articles that would be referred to as a dilute phase or nonsuspension phase of conveying.

Q (BY MR. ROSE) Okay. That's what we referred to earlier when we were talking about dense phase versus dilute phase?

A Yes.

Q Okay. And then so the 25 to 1 reference, that would be to the dense phase --

A That's correct.

Q -- conveyed? Okay. And so does that not represent a pneumatic system for suspending solids in a moving air stream?

A I don't follow your question.

Q Well, if you've got a dense phase operation the particles are suspended in air, and so they are moved with that air?

A No. That's not true at all.

Q How are the particles moved?

A By air pressure and by pressure drop along the line. It's a nonsuspended flow of the material, so you either have a moving bed along the bottom of the pipe, if it's horizontal, or you have a plug of

material across the full cross-section of the pipe. That's dense phase conveying.

Q And what are the solids that are suspended?

MR. WERNER: Objection to the form.

A In a dense phase system there's nothing suspended. It's out of suspension.

Q (BY MR. ROSE) What are the solids that are moved, as shown here?

A The solids that are being moved here are the coal and ash particles, the coal particles that contain ash.

Q So in the -- I just want to make sure I'm understanding clearly. In the instance where the ratio is 25 to 1, that's the dense phase system, correct?

A That's correct.

Q And the particles being moved are the coal and the ash, the coal particles that contain ash.

A That's correct.

Q Okay. And are those particles fluidized?

MR. WERNER: Objection to form, foundation and scope.

A It depends on the mode of dense phase conveying, which in turn depends upon the particles

and the velocity of the air. As I testified a moment ago, you could have -- if it's a relatively fine material, you could have a moving bed of particles on the bottom of the pipe, and although those particles have some entrained air, but not enough entrained air to result in the particles being suspended in the air stream.

Q (BY MR. ROSE) But in that instance there would be entrained air?

A In that instance there would be some entrained air within the particles, within the mass of particles, yes.

Q Within the coal particles that contain ash?

A Not so much within the particles themselves, but --

Q Amongst the particles.

A -- in the void space between the particles.

Q Taking a look back at Exhibit 1007, and the Denseveyor apparatus shown on Macawber Engineering Limited page, the one we looked at last, how big of a unit is the Macawber Denseveyor that's being discussed there?

A The one that's shown in the center doesn't

have any dimensions to it.

Q In your experience how big of a unit is that? You've had experience with those products, correct?

A I have had experience. Typically it's of the size that's shown in that photograph to the left, so it might be something that could be 6, 8 feet tall, or it may be smaller than that, but a variety of sizes. But, again, there's no limitation either in this figure on page 5, or to my recollection, anything in the text that limits this to any particular size.

(Previously Marked Deposition Exhibit Number 1014 introduced to the witness.)

Q (BY MR. ROSE) I've handed you a document that's been marked previously as Exhibit 1014. Do you recognize this document?

A I do.

Q This is the Laster reference that you discuss?

A Yes.

Q Laster refers to drilling mud and the like, and like thick, difficult to pump slurries. Correct? I'm referring to column 1, starting at line 12.

A Yes. I'll just quote: Pumping, drilling mud, and like thick, difficult to pump slurry fluids.

Q And as we discussed, drilling mud is fundamentally different than drill cuttings, correct?

MR. WERNER: Objection to form.

A What I believe I testified is that the cuttings could include some mud, but generally one would want to separate as much of the mud from the cuttings as possible to be able to reuse the mud.

Q (BY MR. ROSE) All right. So mud is -- drilling mud is more free-flowing than drill cuttings; isn't that right?

MR. WERNER: Objection to form. Foundation.

A Well, it's not clear to me from this specification. I'm looking in column 1, starting at line 26, and if I might read it into the record. Quote: The mud used in drilling is quite thick and difficult to move or pump when it is used up. Waste mud frequently runs off the drilling platform to an area below the rig into what is known in the art as the rig cellar. From the rig the unwanted mud, which is often polluted or too filthy to reclaim,

must be pumped to a holding pond or pit, which is known in the art as a "reserve pit".

So in referring to unwanted mud that is polluted or too filthy to reclaim, I understand that wording to refer to a mixture of mud and drill cuttings. I don't know what else would pollute the mud if not drill cuttings.

Q (BY MR. ROSE) But it would still be mud that is contaminated as opposed to drill cuttings with some amount of mud.

MR. WERNER: Objection to the form.

Q (BY MR. ROSE) Isn't there a difference between the two?

MR. WERNER: Objection to the form.

A I think we're splitting hairs. To me it could be one or the other.

Q (BY MR. ROSE) If you could describe for me how the valve system of the Laster reference works. And in particular I'm looking at Figure 3, but if other figures will help, if you would describe how that valve works.

A Well, without going through all of the detailed description of the preferred embodiment starting on column 3, my understanding is that the so-called drilling mud is -- it enters the vessel

through -- I believe through 20, and then once the material is in the vessel it is -- the inlet is sealed, the vessel pressurized, and then as a result of that pressurization, material is then forced out through line 80 at the bottom.

Q And at some point doesn't the valve, which is 35, isn't that used to open and relieve pressure in the vessel? I can refer you to column 4, starting at line 2, where it states, this allows fluid or other weighted material to be added to the interior of the flow chamber 35 to thus provide an adjustability to the buoyant force provided by float chamber 35. It will be appreciated by one skilled in the art that the addition of fluid to flow chamber 5 will displace air and cause a different buoyant effect.

So you understand what they're referring to as far as a buoyant effect?

A I would have to go through this in more detail to be able to answer your question.

Q Well, did you consider that aspect of Laster when you prepared your declaration?

A I did not specifically go through step by step the description of what I considered. And I discuss this in my declaration, is that Laster

describes a device for handling what he calls mud, but it's -- he calls it unwanted mud, which is polluted or too filthy to reclaim, so to me that's another way of describing a paste or a sludge, such as the drill cuttings that are referenced in the patent. So he's describing a means by which this non-free flowing material, which has very similar characteristics to the material that is being described in the Snowdon patent, that that material can be discharged from a container by pressurizing that container. So while the actual device itself in Figure 3 looks different than a blow tank, the technology is similar; namely, put in a non-free flowing sludge or paste-like material, seal the container, pressurize it, and discharge the material through a pipe.

Q So he calls it unwanted mud, which is polluted or too filthy to reclaim. That just means it can't be used anymore, correct?

MR. WERNER: Objection to form.

A I would say so, yes.

Q (BY MR. ROSE) That doesn't necessarily say it has thickened to the point of becoming a paste or a sludge, has it?

MR. WERNER: Objection to form.

A It doesn't say. Doesn't say one way or another. But it does talk about a thick viscous fluid, which is a known drilling mud. But then that mud, in line 26, quite thick, difficult to pump or move when it's used up, and it's often polluted, too filthy to reclaim, must be pumped to a holding pond. So it's a non-free flowing material that I believe could be considered or called a paste or a sludge.

Q (BY MR. ROSE) He also refers in column 1, starting at line 12, the pumping apparatus for dumping drilling mud and like thick, difficult to pump slurry fluids. So he's just referring there to drilling mud, not polluted drilling mud or not drilling mud that's contaminated with cuttings. Drilling mud. And he's referring to drilling mud as being thick and difficult to pump, correct?

A Well, he does use the term drilling mud in line 12. You're correct. But then follows that by saying, quote, and like thick, difficult to pump slurry fluids, close quotes. And then down starting in 26 is where he talks about the contaminated -- I guess line 30, where he talks about the unwanted mud is often polluted or too filthy to reclaim.

Q And then on column 2, starting at line 30, he refers to heavy viscous drilling mud, slurries,

oil and the like, so he's comparing drilling mud to oil.

MR. WERNER: Objection to the form.

Q (BY MR. ROSE) Isn't that right?

A I don't know that I would agree with you. He talks about sufficient to move any fluid, even heavy viscous drilling mud, slurries, oil and the like. So oil could be on its own or in combination with these other materials to make them -- to make it a material that's difficult to move.

Q I want to refer you now to column 5.

(Discussion held off the record.)

MR. ROSE: We can take a break.

(Whereupon, the proceedings were in recess at 2:01 p.m. and subsequently reconvened at 2:15 p.m., and the following proceedings were entered of record:)

Q (BY MR. ROSE) Where we left off, I believe we were talking about the Laster reference, Exhibit 1014. And I had a question on column 5, starting at line 10, and this refers to how the valve works. It states, it will be appreciated that once a buoyant member 30 onto conduit 60 --

A I'm sorry. You skipped a sentence.

Q I did. Once a buoyant force overcomes the

weighted pressure, holding valving member 30 onto conduit 60, air will be allowed to discharge through seat opening 66. This will be an explosive discharge, since one static forces are overcome, compressed air will rapidly fill a space between conduit seal mount 51 and opening 66 and will pressurize this space firstly providing the explosive driving force necessary to power valving member upwardly into its sealing arrangement.

So if I'm understanding this correctly, doesn't this mean that the valve is forced up using a buoyant force?

A It would appear that way. I haven't gone through all of the lines that precede this, but earlier we talked about adding water, it appeared, to lift the valve to seal it, to seal the container.

Q And if that's the case, then, that valve would not work in the case of adding drill cuttings, would it?

MR. WERNER: Objection to form.

A It could.

Q (BY MR. ROSE) If the drill cuttings are not free-flowing wouldn't they just surround the valve and not provide a buoyant force?

MR. WERNER: Objection to form.

A Again, my understanding is the buoyant force is being provided by the water that's added after the drilling mud is added, so the drill cuttings, as you're referring to, if they're down below the valve and then you add water, then as long as you clean off that sealing or seating surface, it seems to me that this would work.

(Previously Marked Deposition Exhibit Number 1009 introduced to the witness.)

Q (BY MR. ROSE) You've now been handed what was marked previously as Exhibit 1009. Do you recognize this exhibit?

A I do.

Q What is this?

A This is edition 1 of the book written by Roy Marcus and three other authors, and it's referred to in my declaration as simply Pneumatic Conveying.

Q And this edition was provided to you by counsel, right?

A It was.

Q Do you use this reference in your day-to-day activities?

MR. WERNER: Objection to form.

A I personally do not use it day to day.

There are others in my company that I wouldn't say use it day to day, but whenever they're involved in pneumatic conveying, they'll typically use or could refer to a later edition of this same document, the same book.

Q (BY MR. ROSE) And at page 6 of Exhibit 1009, the first full paragraph starts with, the ideal candidates for pneumatic conveying are free flowing, non-abrasive and non-fibre materials.

Do you see that?

A Yes.

Q Do you agree with that statement?

A I would agree that these are materials that are much easier to handle and hence easier to convey than other so-called non-ideal materials. But the following sentence notes that, quote, with the development of new types of conveyors operating at low gas velocity, cohesive, abrasive and friable materials can be handled.

Q But that doesn't mention sludge or paste, does it?

MR. WERNER: Objection to the form.

A Those words are not there, but it does refer to a cohesive material, of which a sludge and a paste would be considered cohesive.

Q (BY MR. ROSE) And on pages 3 to 5 of Exhibit 1009 it lists numerous materials for pneumatic conveying under what can be conveyed, correct?

A It lists some of the literally thousands and thousands of materials that are handled in industry on a day-by-day basis and some materials that they use as examples of those that have been pneumatically conveyed.

Q And the vast majority of those are free flowing, non-abrasive and non-fibre materials, correct?

MR. WERNER: Objection to form.

A I wouldn't characterize it that way at all. You'd have to go through material by material.

Q (BY MR. ROSE) Do you see paste identified on here?

MR. WERNER: Objection to form.

A I don't recall. And I'd have to go through line by line, but I don't recall the word paste being in here, but there certainly are paste-like materials that are listed here and I believe I identified in my declaration.

Yes. In Exhibit 1044 I list, in paragraph 76, some of the non-free flowing materials, which

certainly could be a paste -- I'm looking at two-thirds of the way down. I mention paper mill wood paste. Excuse me. Paper mill wood waste (wet). That certainly could be a paste or a sludge. There is an edible paste products listed.

Q (BY MR. ROSE) The majority of what you listed is not paste, correct?

MR. WERNER: Objection to the form.

A It's not clear from just a generic name, activated earth, not clear whether that's a paste or not.

Q (BY MR. ROSE) What about crushed brick?

A Probably not a paste.

Q Or salt?

A Probably not a paste.

Q Sand?

A Probably not a paste.

Q Do you consider this to be a reliable reference, Exhibit 1009?

MR. WERNER: Objection to form.

A I consider it to be a useful reference. It's been revised at least two, maybe three times since it was first published, so there are changes that the authors have made. And with any textbook of this type, there is always room for error or

different ways of presenting things than what others might present it. So I wouldn't say it's the be all and end all as far as pneumatic conveying is concerned, but it's certainly a useful textbook to provide background information.

Q (BY MR. ROSE) Of those materials identified in paragraph 76 of Exhibit 1044, which if any would exhibit the flow characteristics of what's shown in Exhibits 1037 and 1039?

MR. WERNER: Objection to form. Foundation.

A Again, these are just generic names of materials. It's possible that material, as I've already identified, paper mill -- wet paper mill wood waste or edible paste products could have characteristics similar to those shown in these photographs.

Q (BY MR. ROSE) I'd like to turn to page 282. And actually looking over on page 281, that's a drawing of the Denseveyor that we looked at earlier, isn't it?

A Yes, it is. Figure 7.32.

Q And that's referred to on page 282 as a small capacity blow vessel, correct?

A Yes.

Q There's a reference in that first full paragraph on page 282 that the use of such a small capacity blow vessel is designed based on the conveying of material as a series of discrete plugs rather than a continuous stream.

What is the difference between those two?

MR. WERNER: Objection to form.

A It's basically the difference between what I earlier testified is a moving bed type of dense phase conveying and a plug form of dense phase conveying.

Q (BY MR. ROSE) And a plug form of dense phase conveying, is that what we saw in the Ciaffone reference?

A I don't know that Ciaffone described the form of dense phase conveying. I don't recall that he did.

Q Well, they refer here to a small capacity blow vessel. Is that an indicator that the Denseveyor is a small capacity blow vessel?

A That may be the author's term, the author of this book, their term, but I see nothing in the Macawber -- either in Macawber or Macawber Coal Ship that limits the size of the blow tank or the blow vessel. And, similarly, in the patents at issue

here, I don't see anything that limits the size of the blow tank. So while the authors appear to be using this as an example of what they call small capacity, whatever small might be, I don't see that Macawber, either in their literature or in the patents, limits the capacity to any particular maximum value.

Q The author here also says that such blow vessels -- and he's referring to Figure 7.32, which is a Denseveyor -- are designed on the basis of conveying material as a series of discrete plugs rather than as a continuous stream.

Is that author correct?

A I don't believe that that description necessarily applies to all Denseveyor products or Denseveyor applications.

Q Do you have any understanding as to why he would say that then?

A I do not.

MR. WERNER: Objection. No foundation.

Q (BY MR. ROSE) Do you agree with him that, whether they are all used for that, that that's what they were designed for?

A I don't know.

MR. WERNER: Objection to the form.

Foundation.

A I do not know. Again, as I testified earlier, this is a useful reference, but it's by no means the final statement with regard to this whole field.

Q (BY MR. ROSE) Is this a more useful reference than the advertising materials of Macawber that state such things as, whatever the matter, Macawber can handle it?

MR. WERNER: Objection to form.

A This is a textbook. It is many hundreds of pages long, so from that standpoint it has more useful information than a company brochure, but I don't discount the company brochure, either.

Q (BY MR. ROSE) If you would, turn to page 452 of Exhibit 1009. This reference refers to the use of flexible piping. Do you see that?

A Yes.

Q It refers to discharge houses from bulk containers?

A I believe that's a typo.

Q I assume it means hoses.

A Yes.

Q Is there any discussion of using such hoses to load bulk containers?

A I don't see anything in the text, beginning on 452, section 11.5.4, which refers specifically to inlet piping, but I don't see anything that says you cannot use it for that, either.

Q On page 453 there's a reference in that first full paragraph to building up a static charge. Do you have any understanding as to why a static charge builds up?

A There are many dry materials. It could be plastic powders, it could be plastic pellets, that when you rub those particles on a surface that you generate an electrostatic charge, and so that same phenomenon can occur in a pneumatic conveying line.

Q Would that phenomenon occur when conveying pastes?

A No.

MR. WERNER: Objection to the form.

Give me a second to object.

THE WITNESS: Sorry.

(Previously Marked Deposition Exhibit Number 1012 introduced to the witness.)

Q (BY MR. ROSE) You've now been handed what was marked before as Exhibit 1012. This is patent 5,402,857 to Dietzen. Do you recognize this as what

we have sometimes referred to as Dietzen I?
A Yes.
Q What is being performed by the apparatus shown in Dietzen I?
A What is being --
MR. WERNER: Objection to form.
A What is being shown as?
Q (BY MR. ROSE) For example, if you look at Figure 1, can you describe what's being performed there?
MR. WERNER: Same objection.
A What is being shown is pneumatically conveying drill cuttings that had been collected in vessel 17. Or maybe it's vessel 11. But the drill cuttings have been collected there. They're being pneumatically removed by suction by line 22 and conveyed over to container 27 and 24.
Q (BY MR. ROSE) And the materials being conveyed are able to flow by gravity, correct?
MR. WERNER: Objection to the form.
A I don't see where it necessarily says that.
Q (BY MR. ROSE) Take a look at the abstract on the front. Four lines from the bottom doesn't it read, the tank is configured to be emptied via

gravity flow at a remote disposal site by opening the access openings and allowing the cuttings to flow via gravity from the tank interior access openings?

Is that not a reference to gravity flow?

MR. WERNER: Objection to form.

A It is a reference to gravity flow with regard to the containers shown in Figure 1 as 27 and 24 and by rotating that container, but rather than having a horizontal orientation it has a vertical orientation, and the material is able to discharge.

Q (BY MR. ROSE) And the material also flows into the trough 11 via gravity, correct?

MR. WERNER: Objection to form.

A I don't know how material gets into the trough.

Q (BY MR. ROSE) Okay. Let's take a look at column 3. And starting at line 23 it reads, shakers 12 through 15 channel away the desirable drilling mud to a mud pit. The well cuttings fall via gravity into trough 11.

A Yes.

Q So there gravity is being used to introduce those cuttings to trough 11, correct?

A That's correct.

Q And then the material, you had said, goes through line 22 into the container 24, correct?
A 24 and 27.
Q 24 and 27. Thank you. But that's not on the ship, is it?
A I don't know exactly where it is.
Q Okay.
A Could or could not be.
Q Do you see where there are eyelets located as 29, 30 and 31 --
A Yes.
Q -- in Figure 1? Those are used so that a crane can lift that container and transport it to the ship, correct?
MR. WERNER: Objection to form.
A Yes.
Q (BY MR. ROSE) So in that case they're not transferred by pneumatic conveyance to the ship; they're carried to the ship in a container, right?
A Yes.
Q I want to go back to column 1 of the Dietzen I reference. And I'm reading in the first paragraph, with the background of the invention.
A Which line?
Q Starting at line 15.

Even more particularly, the present invention relates to an improved well cuttings disposal system that collects oil and gas well cuttings in a transportable tank that is subjected to a vacuum, formed with a motor driven blower that moves about 300 to 1300 cubic feet per minute of air containing cuttings, and in relatively small hoses to generate flow velocities between about 100 to 300 feet per second.

Can you tell me what's being described there?

A What's being described is basically what's shown in Figure 1. So the material collects in the trough 17, it's then being pneumatically conveyed by suction to 24 and 27, and that is a portable container that then can be moved onto the ship.

Q Where's the motor driven blower that moves 300 to 1300 cubic feet per minute of air?

A The motor is 58 and the blower is 57.

Q And so is it your testimony that they're talking about the cuttings moving through line 22 into containers 27 and 24 at 100 to 300 feet per second?

A That's what is being stated here. That seems like very high velocity, but that's what's

stated.

Q I'd like to look again at Figure 1. And there are two containers in that box in the top middle, 45 and 43. What material is traveling there?

A A mixture of drill cuttings and air.

Q I thought only drill cuttings went to containers 24 and 27.

A Essentially all of the drill cuttings do end up in 27 and 24, but as with any vacuum system there's going to be, in the line that's pulling the vacuum, the potential for some of those drill cuttings to remain in the line, which in this case is line 40, where the vacuum is being pulled. And it's essential that those particles don't enter the blower. Otherwise it's going to ruin the blower. So in between are what I believe Dietzen I calls separators, if I'm not mistaken, 43 and 45, fine separator 43, a second fine separator 45. This is column 4, line 19.

Q With that rate of movement of air, 300 to 1300 cubic feet per minute, would that not entrain or fluidize the materials?

MR. WERNER: Objection to form.

A First of all, this is a volumetric rate,

not a velocity, and, second, this is a vacuum system. I question the numbers that are given here, particularly the 100 to 300 feet per second, but I don't believe there's any fluidization occurring here. It's simply a pneumatic conveying system for sucking the material from 17 into 27 or 24.

Q (BY MR. ROSE) It did refer to a rate, though, because it said 300 to 1300 cubic feet per minute.

A That's the volume of the flow rate of the air.

Q And what's the purpose of the drain 20 in Figure 1? Do materials also flow out the bottom via gravity?

A My understanding -- Well, on column 3, line 31, trough bottom 19 includes a discharge opening 20 that communicates with discharge conduit 21. The opening 20 is typically sealed during operation with a closure plate (not shown).

So the way I interpret this is that most of the material is removed by vacuum line 22 but that there could be some remaining material in the bottom of this trough and that that material would be removed by opening that valve and discharging through 21. Maybe the material is washed down once

the vacuum operation is over. I don't know. It's not clear in the specification.

Q And the material that travels into tanks 24 and 27, that includes drilling mud, correct?

A Well, I think whenever we're talking drill cuttings, as I testified earlier, it is certainly possible that some of the mud hasn't been separated from the cuttings, so, yes, I would expect there's going to be some mud with it.

Q And what are units 12, 13, 14 and 15? Those are coarse shakers, correct?

A That's my recollection, yes. I could go over to the text to find for sure, but --

Q And so those shakers --

A Well, 12 and 13 are coarse shakers, and fine shakers are 14 and 15.

Q What's the difference between a coarse shaker and a fine shaker?

A The opening size of the screen deck.

Q So the shakers 12, 13, 14 and 15 shake the cuttings so that they flow by gravity into the trough 17, correct?

A Yes.

Q Okay. And due to the thixotropic nature of those cuttings at the time that they go in there,

they are not non-free flowing, correct?

MR. WERNER: Objection to form, foundation, and assumes facts.

A I wouldn't characterize it in that way at all. It's certainly not free-flowing material.

Q (BY MR. ROSE) We talked about thixotropic nature, correct?

A Yes.

Q And why do you say they're not free-flowing at all?

A Because the material, while it may be agitated in some way going over those fine and coarse screens, once it drops and consolidates in trough 17 it's not going to be free-flowing any longer, if it ever was at all.

Q Does it need to set up in time in order for the thixotropic nature to take effect?

MR. WERNER: Objection to form, and assumes facts.

A No. It doesn't take -- it does not necessarily take time for this to occur.

Q (BY MR. ROSE) Correct me if I'm wrong, but I thought you testified earlier about the use of shakers or stirrers to -- and the thixotropic effect of pastes, that when at rest they are much more

non-free flowing than when stirred up or shaken, which improves their flowing capabilities. Isn't that the nature of thixotropic?

MR. WERNER: Objection to form. Mischaracterizes testimony.

A At the point where the material is agitated, in general the material is more free-flowing, although I would not even at that point characterize it as a free-flowing material, but it is more flowable than when you don't have that agitation. But as soon as the material drops from 12, 13, 14, 15, into 17, the material is no longer being agitated, no longer being stirred, and so it's going to lose that more free-flowing ability, capability soon after it -- in fact, probably at the instant that it drops into trough 17.

Q (BY MR. ROSE) So does the, quote, more flowable nature go away immediately when shaking stops, or does it take time to set up?

MR. WERNER: Objection to form.

A It depends. Again, drill cutting is such a general term to describe such a wide range of materials, I could envision conditions where it sets up immediately and other conditions where it might

take minutes or hours to set up.

(Previously Marked Deposition Exhibit Number 1013 introduced to the witness.)

Q (BY MR. ROSE) I've handed you a document that was marked previously as Exhibit 1013, U.S. Patent 6,179,071 to Dietzen. Do you recognize this as what we referred to or you referenced to previously as Dietzen II?

A Yes.

Q Can you describe generally what's taking place or being shown in Dietzen II?

MR. WERNER: Objection to form.

A Referring to Figure 1A, drill cuttings are being collected in trough 77. They're being suctioned using line 37 into vessels 26, 27, 28. The blower that's providing the suction is 30. Once the material is collected there and a ship then comes along, a ship or a boat, which is 20, then a flexible line 4 is connected between 31 on the rig and storage vessel 23 on the boat, a vacuum is pulled in 23 using line 25 and blower 22, and the material is vacuum conveyed from 26 or 27 or 28, through 31, into 24 and then into 23.

Q (BY MR. ROSE) And then what happens once the material is on the boat?

MR. WERNER: Objection to form.

A There can be some processing that occurs, as shown in Figure 11, box 20, or Figure 12, also box 20, and then eventually the material then leaves the boat and goes on shore.

Q (BY MR. ROSE) So did I understand correctly that a vacuum is used to suction the cuttings from trough 77 to the tanks?

A Yes. The tanks 26, 27, 28, and then later a vacuum is used to suck from those tanks into tank 23 on the boat.

Q And referring to column 5 -- Well, step back. Dietzen II is the only reference that you've relied on that teaches transfer of cuttings to a ship, correct?

MR. WERNER: Objection to form.

A Well, Dietzen I has this container 24 and 27, which would then be picked up and presumably put onto a ship. I'd have to go through the specification to see if it mentions specifically a ship, but the intent is that that container would be moved in place and presumably onto a ship.

Q (BY MR. ROSE) That would be unit handling that you described earlier?

A Yes.

Q That would not be a flow of material, correct?
A The movement of that container from the rig to the ship would not be what I call bulk handling, but it would be unit handling.
Q Now, so the vacuum is used to suck material from the trough to the tanks, correct, on the rig?
A Yes.
Q Okay. And then once they're in those tanks -- I'm referring now to column 5. And here they're talking about -- This is in the second full paragraph starting at line 22, and they're referring to Figures 2, 3, and 3A, shows the construction of one of the vacuum tanks. And the interior of the vacuum tanks at the lower end -- this is reading at line 29 -- at the lower end of tank 28, interior 40, and auger or augers can be used to transfer cuttings that settle in tank to discharge line 32.
So an auger is what's being primarily used to convey the cuttings at the bottom to line 32; isn't that correct?
A That isn't correct.
MR. WERNER: Objection to form.
Q (BY MR. ROSE) Did I read that

incorrectly? An auger or augers 44 can be used to transfer cuttings that settle in tank 28 to discharge line 32.

MR. WERNER: That's a different question, but you can answer.

Q (BY MR. ROSE) If I framed it poorly I apologize. But isn't an auger being used to transfer cuttings that settle in the tank to the discharge line?

MR. WERNER: Objection to form.

A First of all, Mr. Rose, I would point out that it says can be used. It does not say that it must be used. And indeed in some of the claims it mentions the inclusion of an auger, and other claims do not.

Q (BY MR. ROSE) You understand there's a difference between a patent's disclosure and a patent's claims, correct?

A I understand. But, again, the word is can. It doesn't say must. Second, it talks about the cuttings that settle in the tank. So to me, because it's a horizontal tank, there is the possibility that, over time, some of those cuttings are going to settle to the bottom of the tank and thereby not be removed by the vacuum that develops

through line 32. So in order to achieve complete or nearly complete cleanup of the tank, an auger can be used to do that, to effect that final cleanout. It is not the primary means of discharge. The primary means of discharge is suction.

Q So the cuttings at the bottom of the tank are non-free flowing and an auger removes it; isn't that correct?

MR. WERNER: Objection to the form.

A I believe that all of the cuttings are non-free flowing, but some are less flowable than others, and in order, as I said, to effect complete or nearly complete cleanout of the vessel, an auger can be used.

Q (BY MR. ROSE) Let's go back to Figure 3A. What is the material that's identified by 40? Or what is 40 identifying?

A I believe it's the cuttings, but let me be certain. I misstated. At column 9, at the very top, part number 40 is the interior of the tank.

Q I guess that leads to my next question, which is, what is item 79? What is being drawn into it by those arrows?

A Well, again, column 9 indicates that 79 is a screen, 78 is a suction line.

Q So is something being suctioned out through line 78?
A I believe the text -- or the specification references this as an alternative, as far as Figure 3A, as opposed to Figure 3, that that is the possibility that, if there is some separation and there's some liquid near the top of this container, that that liquid could be -- it could be sucked out of the container. Let me just refer, if I could, to the specification to confirm that.
Yes. Column 5, starting at line 45, the suction line 78 can be used to recycle drilling fluid after solids within the interior 40 of tank 28 have settled, leaving the drilling fluid as upper portion of the material contained within interior 40 of tank 28.
Q So what's happening in tank 28 is, the combination of drill cuttings and drill mud are going into the tank, the drill cuttings settle on the bottom, and the drill mud is suctioned out through line 78? Am I understanding that correctly?
MR. WERNER: Objection to form.
A Well, it calls here the drilling fluid after the solids have settled.
Q (BY MR. ROSE) And so the solids that

settle on the bottom as shown in Figure 3 and 3A are moved using an auger, correct?

MR. WERNER: Objection to the form.

A No. No. Again, that's not what I've said. What I've said is that the primary movement of the solids, the drill cuttings within this vessel, is by suction, and if there's some -- if as much material had been withdrawn as possible by suction, then the screw is used at the bottom to effect final cleanout, as much as possible, of this container.

Q (BY MR. ROSE) Where do you get that, that it's used to effect final cleanout?

A Well, again, I refer to column 5, line 30, can be used to transfer cuttings that settle in the tank.

Q All right. So if there is settling in the tank, that means that the cuttings have separated from the drill fluid, the drill fluid is suctioned out and the cuttings that settled are then augered out?

A No.

MR. WERNER: Objection to the form. Assumes an impossible fluid.

A No. I don't see it that way at all. I

see that we have material inside this vessel, inside this container, that consists primarily of drill cuttings, but there could be some amount of drill mud interspersed with drill cuttings. Even if there is no -- Even if there is no drilling mud, this paste or sludge could -- over time and with movement on the oil rig, there could be some settlement of some portion of the cuttings within this container that then accumulate at the bottom of this tank. And because we're dealing with a horizontal tank, not a vertical tank, as in -- shown in most of the examples in the pneumatic conveying and also the Snowdon patents, if that were to occur, then it's possible, as shown in Figure 3 and 3A, to have a screw to clean out that settled material. But, again, it doesn't say that you must have that screw. Indeed, many of the claims do not include a screw.

Q (BY MR. ROSE) Right. Again, I'm not worried about the claims. I'm worried about the disclosure. And I want to go back to my last question, where you were talking about a final cleanout or a final cleanup, and I don't know where that is in this reference. Can you show me where it says something about a final cleanout?

MR. WERNER: Objection. Asked and

answered.

A I do not see the word final cleanout, but to me it is obvious that, if you have a horizontal vessel that is located on a drill rig and you want to utilize as much of the capacity of that vessel as possible so that you don't have to have a boat next to the rig at all times, that you have some ability to accumulate material in this vessel, in this container, until the next ship comes. So you want to clean out the vessel as much as possible when the material is being discharged onto the boat. And because of the fact that it is a horizontal container and not vertically oriented, and because there is the possibility that some of the -- some portion of the drill cuttings may settle to the bottom of this tank, it stands to reason to me that that would be the purpose of having this screw to remove that settled material and thereby clean out the vessel as much as possible so that you have as much of the volume usable the next time that you are filling it.

Q (BY MR. ROSE) So am I understanding correctly, then, that you're saying that there are three layers within the tank, namely the drill fluid that's being suctioned out via line 78, the drill

cuttings, and then a separate group of drill cuttings that settle to the bottom?

MR. WERNER: Objection to the form.

A I'm not saying that there are three distinct layers. I'm saying that I would call all of the material in this container the drill cutting. As I've testified earlier, drill cuttings could contain some amount of drilling mud. So there could be water and oil that is -- that has not been separated from the drill cuttings when the material is put into this container. And so given the movement of the rig, given the time that material sits in this container before the next boat arrives, given the highly variable characteristics of drill cuttings, you could have a situation -- you could have several situations. You could have one where it's possible to completely discharge this container by using suction through line 32. You could have a situation -- And that's covered by some of the claims. You could have a situation where some of the drill cuttings settled to the bottom of this container, and so after you have suctioned as much of it as possible through 32, you turn on the screw conveyor to clean out as much as possible to empty the container. And, third, you could have a

situation where, not only do you have some settlement of larger, denser particles to the bottom, but you have some more liquid material that is at the top of this container, and that then is sucked out, through 79, through line 78.

Q (BY MR. ROSE) Does the Dietzen II reference describe those three different scenarios specifically, or is that something that you've come up with just by looking at the way the drawings are set up and -- Where are those three separate scenarios described in Dietzen II?

MR. WERNER: Objection to form.

A To me it's obvious, in reading the patent, that the auger shown in 3 and 3A is an optional piece of equipment; it's not essential. Furthermore, that the screen and the suction line in 79 and 78 in Figure 3A, again, optional pieces of equipment. So it's obvious to me that Dietzen II is providing for a variety of conditions that could occur in this vessel.

But the primary point I want to emphasize is that Dietzen II, as with Dietzen I, is teaching that you can take drilling mud -- excuse me -- drilling cuttings and pneumatically convey drilling cuttings from one vessel to another vessel. In

Dietzen I it's conveying it to a portable container. In Dietzen II it's conveying it from a trough to a container on the rig and then from the container on the rig to a container on the boat.

Q (BY MR. ROSE) In referring further in Dietzen II to column 7, here they're talking about -- talking, starting at line 14, discussion of Figures 9 and 10. There is yet another auger being used to direct the drill cuttings discharged by tanks 103, correct?

A Well, in column 7, starting at line 2, talks about what Dietzen II calls optional treatment features, so there's Figures 9 and 10, which show some optional treatment figures on the boat, on the deck of the boat, and in Figure 12 -- Figures 11 and 12 show these optional treatment figures -- features below the deck of the boat, or I suppose it could be below the deck of the rig, also.

Q Right. The optional treatment feature being, for example, the recycling of the drilling fluid that's referenced there in line 10. But to get the cuttings out of tanks 103 --

A In which figure?

Q In Figures 9 and 10. And in 7 and 8.

A Well, I'm looking now at Figure 11. And

12 is probably -- Let's look at Figure 11. So Figure 11, box 20 shows what's happening on the boat. Let's go up to the top. So box 11 is showing what's happening on the rig, and so a vacuum is being pulled with 30 to pull material from trough 71 into tanks 26, 27, 28 and 29, and then using blower 22 and line 24, which is then connected to line 31. So the material is being vacuumed from 26 through 29 into tanks 103. And then using that same vacuum system 22 on the boat, the material is then being vacuumed from 103 through line 110 into 108, which as I recall is a grinder.

I'm not sure I've answered your question, but that's the way I look at the system. And then there's things downstream of 108.

Q Right. You had -- I had asked you previously about the auger in column 7, and you had said, well, column 7 is talking about optional treatment features. And I think -- I agree with that, but I think what they're talking about as optional treatment features are what takes place below 103. I mean, in all instances the material is going to go from tanks 26 through 29 on the rig down to tanks 103 on the boat, correct?

A Yes.

Q And then the optional treatment features are taking the material from 103 and doing things with them, such as in tanks 101, or the grinder, 108, right?

A Well, it's partially right. It's through grinder 108, and then there's some sort of a screening operation 113 that's separating the material into 114 and 115, and then that material is being pulled by vacuum into 101 through line 117.

Q And in each of the tanks shown in Figures 11 and 12, as 26 through 29, and in each of the tanks 103, do you understand that those two circular objects in the bottom of each tank represent augers?

A Yes.

MR. ROSE: Let's take a quick break.

(Whereupon, the proceedings were in recess at 3:23 p.m. and subsequently reconvened at 3:39 p.m., and the following proceedings were entered of record:)

Q (BY MR. ROSE) I wanted to talk just briefly about the Dietzen I reference we were talking about before.

A Yes.

Q And we were talking about the materials,

because they're thixotropic, coming out of the shakers 12, 13, 14 and 15 and dropping into the trough 17. Do you know what temperature those materials would come out of those shakers at?

MR. WERNER: Objection. Form, foundation.

A I do not.

Q (BY MR. ROSE) Do you know how long it would take those materials to set up once they fell into the trough?

MR. WERNER: Objection to form, and foundation.

A I do not.

Q (BY MR. ROSE) Looking at Exhibits 1038 and 1037, maybe 1039 over there as well, do you know if that's what the materials would look like when they came out of shakers and landed into the trough on Dietzen?

MR. WERNER: Objection to form.

A As I indicated in my declaration, I believe that these still shots and the accompanying videos represent one form of drill cuttings that these patents are designed to handle. Again, as I've testified on numerous occasions here today, drill cuttings, pastes, sludge are all terms for which there's no defined bounds as to what

constitutes these materials. As I testified earlier, it's somewhere between a dry bulk solid and a liquid, somewhere in between. So I believe that, again, these Exhibits 1037 to 1039 and the accompanying movies present examples of drill cutting, but by no means are they the only way which drill cuttings could be -- by no means the only forms of drill cuttings.

Q (BY MR. ROSE) Right. And I may not have asked my question clearly. What I was trying to get at is the form or the condition of the drill cuttings. You said these are drill cuttings of the patents. You're referring to the patents that are being challenged here?

A Yes.

Q All right.

A And I will also say Dietzen I and Dietzen II. Again, it's all drill cuttings, which there's no metes and bounds as to what constitutes drill cuttings.

Q And my question originally was -- I am more focused on the condition of the drill cuttings when they come out of a shaker. Are what we see in these pictures and what we can see in those videos, are they in a state of fluidity that would be

similar to just coming off the shakers? Would they be more viscous than what comes off the shakers? Less viscous? Is there any way to tell what their viscosity would be as you see them in these videos and images as compared to what comes off the shaker?

MR. WERNER: Objection to form.

A There's no way to tell.

Q (BY MR. ROSE) And are you saying that it's -- that indeed it may be that they would congeal or set up with those thixotropic properties instantly when they land in the trough?

MR. WERNER: Objection to form.

A Anything is possible with such a non-homogenous material, undefined homogenous material.

Q (BY MR. ROSE) And how do you know that there are other types of drill cuttings?

MR. WERNER: Objection to form.

A It's just by common logic, that when you're taking a drill, putting it on an ocean bed or a sea bed and drilling through hundreds if not thousands of feet of subsea material -- which can vary widely in terms of the chemical composition, geological formation, everything -- that you're going to have an extremely variable material. And

that, to me, is the nature of drill cuttings. Not only the formation through which the drill is working, but also the manner in which the drill is operating, the size and rotational speed of the drill, the type of drilling mud that's used. All of those I would expect can and does have an influence on the properties of the drill cuttings.

MR. ROSE: We're at a good stopping point for the day.

MR. WERNER: Okay.

(Whereupon, at 3:44 p.m., Tuesday, August 9, 2016, the taking of the Deposition of JOHN W. CARSON, PhD was in recess.)

* * *

I, JOHN W. CARSON, PhD, do hereby certify that I have read the foregoing transcript of my Deposition and believe the same to be true and correct (or, except as follows, noting the page and the line number of the change or addition desired and the reason why):

Page	Line	Change or Addition	Reason

_____

Dated this ____ day of _____, 2016.

STATE OF MINNESOTA)
) ss. CERTIFICATE
COUNTY OF ANOKA:)

Be it known that I took the deposition of JOHN W. CARSON, PhD on the 9th day of August, 2016, at Minneapolis, Minnesota;

That I was then and there a Notary Public in and for the County of Anoka, State of Minnesota, and that by virtue thereof, I was duly authorized to administer an oath;

That the witness, before testifying, was by me first duly sworn to testify the whole truth and nothing but the truth relative to said cause;

That the testimony of said witness was recorded in shorthand by me and was reduced to typewriting under my direction;

That the cost of the original transcript has been charged to the party noticing the deposition, unless otherwise agreed upon by Counsel, and that copies have been made available to all parties at the same cost, unless otherwise agreed upon by Counsel;

That I am not related to any of the parties hereto nor interested in the outcome of the action;

That the reading and signing of the deposition by the witness and the Notice of Filing were reserved.

WITNESS MY HAND AND SEAL this 15TH day of AUGUST, 2016.

Christine K. Herman, RPR, CRR

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