UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GENERAC POWER SYSTEMS, INC.,

Petitioner

v.

CHAMPION POWER EQUIPMENT, INC.,

Patent Owner

Case IPR2025-01271

Patent No. 10,697,398

VIDEOTAPED DEPOSITION OF TIMOTHY L. MORSE, Ph.D., P.E.

Thursday, May 14, 2026 8:24 a.m.

Courtyard by Marriott Boston Natick

342 Speen Street, Natick, MA 01760

Reported by:

Janet McHugh, RMR, CRR, CLR

JOB NO. 00185492

May 14, 2026

8:24 a.m.

Videotaped deposition of TIMOTHY L. MORSE, PH.D., P.E., held at the Courtyard by Marriott Boston Natick, 342 Speen Street, Natick, Massachusetts, pursuant to Agreement, before Janet McHugh, a Registered Merit Reporter, Certified Realtime Reporter, Certified LiveNote Reporter, and a Notary Public within and for the Commonwealth of Massachusetts.

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1 I N D E X

2 WITNESS DIRECT CROSS

3 TIMOTHY L. MORSE, Ph.D., P.E.

4 By Mr. Finch 5

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7 PREVIOUSLY MARKED EXHIBITS

8 Number Page

9 Exhibit 1005 70

10 Exhibit 1003 74

11 Exhibit 1012 106

12 Exhibit 1009 106

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1 P R O C E E D I N G S

2 TIMOTHY L. MORSE, Ph.D., P.E.,

3 having been duly sworn, after presenting

4 identification in the form of a driver's license,

5 deposes and says as follows:

6 CROSS-EXAMINATION

7 BY MR. FINCH:

8 **Q Good morning, Dr. Morse.**

9 **Will you please state your full name and**

10 **address for the record.**

11 A The name is Timothy Lester Morse. And,

12 actually, do you want my work address or my home

13 address?

14 **Q Work address is fine.**

15 A So that is 1075 Worcester Road in

16 Natick, Massachusetts.

17 **Q We met a few minutes ago, but my name**

18 **is Tom Finch. I represent Champion in connection**

19 **with IPR 2025-01271, which relates to U.S. Patent**

20 **No. 10,697,398.**

21 **And you previously submitted a declaration**

22 **in connection with IPR 2025-01271, correct?**

A Yes.

Q And you understand that you're here today to testify in connection with that declaration?

A Yes.

Q Okay. Dr. Morse, have you been deposed before?

A Yes.

Q Roughly how many times?

A I don't keep a precise count. Maybe 20 to 30 times.

Q So you're familiar with the process, but just to clarify things, I'm going to go over a couple of guidelines that will make sure things run smoothly today.

First, you understand that you're under oath?

A Yes.

Q Okay. Any reason you cannot give full, accurate, and truthful testimony today?

A No.

Q Because the court reporter is present

1 and recording your testimony, please do your best
2 to respond verbally to my questions.
3 Do you understand?
4 A Yes.
5 Q And we'll agree, from the start, just
6 to not talk over each other. So I will let you
7 finish your answers, and you let me finish my
8 questions.
9 Is that fair?
10 A Yes.
11 Q If you don't understand a question, let
12 me know, and I will try and rephrase it.
13 Is that fair?
14 A Yes.
15 Q And if at any point you need a break or
16 if the court reporter or anyone else needs a
17 break, just let me know, and I'll just ask that
18 we finish the question or series of questions and
19 then we can take a break.
20 Does that sound good?
21 A Sounds good.
22 Q Do you have any questions before we get

1 **started?**
2 A No.
3 **Q So you said you've been deposed**
4 **20 to 30 times before; is that right?**
5 A I believe --
6 **Q Roughly?**
7 A -- I said I don't keep a precise count,
8 but it was something like 20 to 30.
9 **Q Okay. What types of cases were those**
10 **in connection with?**
11 A It's been a variety of types of
12 matters.
13 **Q Okay. Can you give me some examples?**
14 A So some matters that I have testified
15 before have been what I would call a "failure
16 analysis" matter, where something has exploded or
17 caught fire or broke, and I'm providing expert
18 opinions as an engineer regarding the cause of
19 the failure.
20 I provided testimony in intellectual
21 property matters. And I've provided testimony in
22 matters where there's some dispute over the

1 engineering meaning of certain regulations.
2 **Q For the failure analysis cases that**
3 **you've testified in before, what types of**
4 **products did those relate to?**
5 A Well, some of them involved things I
6 wouldn't really consider a product. They may
7 involve a failure at a power plant or industrial
8 processing facility.
9 But I've also worked on failure analysis
10 projects that have involved products, such as
11 consumer appliances, HVAC equipment, gas piping,
12 combustion equipment, vehicles.
13 That's what I can recall at the moment.
14 **Q Thank you. What types of consumer**
15 **appliances are you talking about?**
16 MR. STEMLER: Objection. Relevance.
17 A So it's hard for me to remember
18 specifics. As I sit here, I'm thinking about the
19 types of projects I've worked on. And I
20 understand your question to be asking me about
21 projects that I've testified on, and it's hard
22 for me to remember whether a project I worked

on -- whether I actually got to the point where I was testifying or not.

But the kinds of things might be consumer electronics, household appliances, so like a dishwasher or a dryer. I've worked on projects involving portable generators. Probably a broader range of things than I can remember as I sit here.

Q When you said you worked on projects involving portable generators before, do you remember specifically which portable generators were at issue in those projects?

MR. STEMLER: Objection. Relevance.

A No. I don't remember specific models, but I've worked on projects that have involved generators that would be, you know, fixed, like a whole-house generator, generators that are portable that you can carry from a handle, and then generators that are portable that are on wheels that you can wheel around.

I've worked on projects involving all those types of generators.

Q And other than the fixed or portable nature of those types of generators, are there other differences between a fixed generator versus a portable generator?

MR. STEMLER: Objection. Form.

A I mean, there's lots of things that can define a generator besides whether it's fixed or portable.

Typically, a portable generator is smaller so that engine displacement will be smaller, the kilowatts it can supply would be smaller. But that is not covering the full range of variations that might exist.

Q When you say "engine displacement," what does that mean?

A So that's just a way to characterize the size of an engine for -- whether it's for a generator or for a vehicle or something else, just the size of an internal combustion engine. So one way to characterize it is by the total displacement.

Q Got it. And I have a software

background. I'm not a mechanical engineer by trade.

When you say "engine displacement," like, what does that actually mean?

A So a combustion engine works by compressing a fuel and then igniting the fuel, and then that fuel expands to push on a piston, which drives a shaft, which powers the engine.

And so "displacement" refers to the volume displacement from the compressed condition of the cylinder to the expanded condition of the cylinder, which is also multiplied by the number of cylinders.

Q And typically, for the portable generators that you've worked on, what would be kind of an average displacement that you would see in an engine?

MR. STEMLER: Objection. Relevance.

A I can't really pick an average. It depends upon the size.

Q What would be the range of sizes you would see in portable generators?

MR. STEMLER: Objection. Relevance.
A I don't think I could identify a specific range, as I sit here.
Q Can you identify any example of an engine displacement for a portable generator that you've worked on or that you know of?
MR. STEMLER: Objection. Relevance.
A It's just not a number that I can pull up right now from my memory.
Q So sitting here today, you don't know what a typical engine displacement would be for a portable generator?
MR. STEMLER: Objection. Form.
A I don't think there is a typical. I think it varies.
Q I think earlier you testified that engine displacement was a measure of the size of the engine; is that correct?
MR. STEMLER: Objection. Form.
A I don't recall whether I used those specific words, but that sounds about right. Yes.

Q Are there other measurements of the size of an engine besides engine displacement?

A So you also characterize it -- you could characterize it, like, physically by its physical dimensions, if that were relevant.

Another way to characterize it is by the power of the engine.

Q Okay. When you say "power of the engine," what does that mean?

A Power is work divided by time.

Q And what units would that be measured in?

A You could measure it in different units. Kilowatts or horsepower may be typical measurements.

Q And sitting here today, do you have an understanding of the range of power that is typical in portable generators?

MR. STEMLER: Objection. Relevance.

A I have a general sense, but it can vary.

Q What is your general sense?

A So a typical small portable generator might have a power of 5 kilowatts. A larger portable generator may be 20 kilowatts. But that's just generally.

You can have smaller and larger portable generators.

Q And what structural components of a generator impact what its power output is going to be?

MR. STEMLER: Objection. Relevance.

A I mean, it's really like the entire configuration of the engine, but then in addition to that, it's the configuration of the generator.

I mean, I guess I would say essentially all of the generator is relevant for its power output.

Q Taking a step back, you mentioned earlier that you have worked on projects related to gas piping before; is that correct?

A Yes.

Q What, at a high level, did those projects entail?

MR. STEMLER: Objection. Relevance.

A So I've worked on a number of projects involving gas piping. So I'm not sure I could fully generalize, but I've worked on projects involving different types of gas piping in residences, in businesses.

I've also worked on projects that involve utility gas piping, so whether that's transmission piping or distribution piping.

Q And those projects related to failure analysis?

A I would say most of them. I probably also worked on projects that involved regulatory analysis or safety analysis for gas piping systems.

Q What sort of failures would you see in gas piping systems?

MR. STEMLER: Objection. Relevance.

A So I've worked on projects where there is a leak in a gas pipe, and -- actually, the majority of projects that I worked on was a gas leak. There was eventually also ignition of the

fugitive gas and an explosion.

Q When you say "gas piping," is that different from liquid piping?

MR. STEMLER: Objection. Relevance.

A Generally, yes. Although you can use the same piping for both gas and liquid in some contexts.

Q And when you say "generally, yes," what differences are you thinking of between gas piping and liquid piping?

MR. STEMLER: Objection. Form. Relevance.

A Well, for example, projects that I work on that involve gas piping at a residence are typically carrying natural gas or propane.

Projects that I work on that involve liquid piping in a residence typically carry water, so the working fluid is different. That's one difference.

Q And when you say "working fluid," "fluid" there refers to generally either a liquid or a gas?

MR. STEMLER: Objection. Form.

A Yes. When I used the word "fluid" in my previous answer, I was referring to either a liquid or a gas.

Q How does the working fluid impact the type of piping used in an application?

MR. STEMLER: Objection. Form. Relevance.

A Well, it really depends. So if you're thinking about the flow rates, you might choose a different size pipe if you are flowing a liquid versus a gas. You also might not. It depends.

Depending on the fluid, you might be concerned about chemical compatibility of the piping material with the liquid you're carrying.

Often, there's considerations when you're designing a piping system with cost and weight associated with the piping material that is chosen. And the working fluid can also have an impact on that, although it doesn't always.

Q Why is chemical compatibility important for piping selection?

MR. STEMLER: Objection. Form. Relevance.

A Well, if you have a pipe material that is not chemically compatible with the working fluid, then you could either get contamination of the working fluid from the pipe, which may or may not be a problem, depending on what you're using the fluid for, or you might have degradation of the pipe due to interactions with the liquid that could lead to failure or a leak of the pipe. Those would be some examples of why you might care about chemical compatibility.

Q How is flow rate impacted -- scratch that.

When selecting a pipe for a liquid or a gas fluid, why is the flow rate or size of the pipe important?

MR. STEMLER: Objection. Form. Relevance.

A Well, when you flow a fluid through a pipe, that is going to result in frictional losses that are going to decrease the pressure

1 along the direction of the flow.
2 And the effect of that on the flow rate
3 depends upon the working fluid. It depends upon
4 the piping material. It depends upon the piping
5 diameter.
6 And when you're deciding pipe sizes, one
7 thing you're considering is what flow rates do I
8 need to be having through this pipe. And so that
9 might motivate you to make a different choice
10 associated with the size of the pipe, depending
11 upon the fluid characteristics of the working
12 fluid and the specific engineering needs of the
13 application.
14 **Q Is the flow rate impacted based on**
15 **whether or not the working fluid is a gas or a**
16 **liquid?**
17 MR. STEMLER: Objection. Form.
18 Relevance. Also objection to scope.
19 Counsel, I don't believe this topic is
20 discussed anywhere in Dr. Morse's declaration.
21 And the scope of the Cross-Examination testimony
22 is supposed to be commensurate with the scope of

the Direct Examination testimony. So can you please point us to where in the declaration you're asking about.

MR. FINCH: Dr. Morse spent a significant portion of his declaration, or several paragraphs, talking about his experience and background and also attached his CV. So I'm getting a sense of what his background is and his knowledge of the subject.

MR. STEMLER: Okay. Same objection. I don't see how knowledge of flow rates versus -- in liquid versus gas pipes is particularly relevant to his prior work experience.

BY MR. FINCH:

Q Dr. Morse, I'm going to restate the question.

Is the flow rate impacted based on whether or not the working fluid is a gas or a liquid?

A Well, the engineering principles are the same. The equations you would use are the same whether you're talking about a gas versus a liquid.

1 The fluid properties that you put into those
2 equations to get the answer depend upon the
3 specific working fluid and whether that working
4 fluid is a gas or a liquid.
5 **Q Dr. Morse, taking a step back to your**
6 **prior deposition experience, have you ever been**
7 **deposed on behalf of Generac before?**
8 MR. STEMLER: Objection. Relevance.
9 A I don't recall any such instance.
10 **Q Have you ever served as an expert in an**
11 **IPR proceeding before?**
12 MR. STEMLER: Objection. Relevance.
13 A I believe I have, to my recollection.
14 **Q What did you do to prepare for today's**
15 **deposition?**
16 A I reviewed my declaration and the prior
17 art that is cited in my declaration.
18 **Q Did you meet with anyone as part of**
19 **your preparation?**
20 A Yes.
21 **Q Who did you meet with?**
22 A I spoke with a colleague of mine at

1 Exponent, Dr. August Young. And I spoke with
2 attorneys from Merchant & Gould.
3 **Q What did you speak -- who is Dr. August**
4 **Young?**
5 A She is a mechanical engineer. She's a
6 colleague of mine at Exponent, which is the firm
7 at which I'm employed.
8 **Q What did you speak with Dr. Young**
9 **about?**
10 A I spoke with her about my declaration.
11 **Q And why did you speak with Dr. Young**
12 **about your declaration?**
13 A She is a mechanical engineer who's
14 knowledgeable about engines and generators. She
15 assisted me on this project, and so I was just
16 discussing my declaration with her as I prepared
17 for this deposition.
18 **Q What role did Dr. Young have in**
19 **assisting you on this project?**
20 A So I think there's two main roles that
21 she had. So she reviewed some, maybe not all, of
22 the prior art that is cited in my declaration.

1 And she and I discussed the prior art as I was
2 writing my declaration. She also reviewed my
3 declaration to check for any engineering errors,
4 and that's part of our standard quality control
5 system at Exponent, where work is checked by a
6 second engineer.
7 **Q You mentioned earlier that you spoke**
8 **with her about your declaration. What**
9 **specifically did you talk with Dr. Young about**
10 **your declaration?**
11 A I don't remember specifically. Just
12 refreshing my memory on the declaration, the
13 prior art, so we discussed different parts of my
14 declaration.
15 **Q When did you speak with Dr. Young?**
16 A Over the course of this week. But I
17 don't remember specifically when.
18 **Q Roughly how long did you talk to**
19 **Dr. Young for?**
20 A I think I had maybe two conversations
21 with her, so all told, not more than an hour.
22 **Q Other than Dr. Young and Generac's**

1 **attorneys, did you meet with anyone else to**
2 **discuss today's deposition?**
3 A No.
4 **Q You said that one of Dr. Young's roles**
5 **in assisting you with this project was that she**
6 **reviewed some but maybe not all of the prior art;**
7 **is that correct?**
8 A Yes.
9 **Q Did you review all of the prior art?**
10 A Yes.
11 **Q Did you review all of the prior art in**
12 **detail, or did you rely on Dr. Young's analysis?**
13 MR. STEMLER: Objection. Form.
14 A I would say I reviewed all the prior
15 art in detail and I relied on Dr. Young's
16 analysis.
17 **Q Did you review any documents in**
18 **preparation for today's deposition?**
19 A Yes.
20 **Q Which documents?**
21 A My declaration and the prior art cited
22 in my declaration.

1 **Q Did you review any other documents?**
2 A No.
3 **Q Your declaration --**
4 A Actually, I'm sorry. There's probably
5 a clarification that is needed. I also reviewed
6 the '398 patent, which is, strictly speaking, not
7 my declaration or a prior art cited in my
8 declaration, but I also reviewed that as part of
9 my preparation for today. And I apologize for
10 not giving that answer earlier.
11 **Q Understood. I'm sure that would have**
12 **come out at some point today that you had**
13 **reviewed the patent, but I appreciate --**
14 A I thought it maybe was not even worth
15 clarifying, but here we are.
16 **Q And the '398 patent relates generally**
17 **to a dual fuel engine; is that correct?**
18 A Yes.
19 **Q And at a high level, what is your**
20 **understanding of what is a dual fuel engine?**
21 MR. STEMLER: Objection to form.
22 A Are you asking me in the context of the

1 '398 patent or are you asking me generally,
2 separate and apart from the '398 patent, what a
3 dual fuel engine is?
4 **Q Let's start with separate and apart**
5 **from the '398 patent.**
6 A So it's an engine that can operate on
7 more than one fuel.
8 **Q What types of fuels can be used in a**
9 **dual fuel engine?**
10 A So generally? We're not talking about
11 the '398 patent now?
12 **Q Correct.**
13 A Well, I would think -- there are
14 certain fuels that are more suitable for use in
15 an engine than fuels that may be useful for a
16 heating appliance.
17 But generally speaking, there's a wide range
18 of fuels that can be used for an engine. And you
19 could have a dual fuel engine that relies on two
20 of those many range of fuels.
21 **Q Do you have any experience with dual**
22 **fuel engines in your professional career?**

MR. STEMLER: Objection. Form.

A Yes.

Q Okay. What types of fuels were used in the dual fuel engines that you have experience with in your professional career?

A So I've worked on engines that can run on gasoline or compressed natural gas. I've worked on engines that can run on diesel or biodiesel, which is similar but not the same as diesel. And I've worked on engines that can operate on gasoline or propane.

There may be other dual fuel engines I have experience with, but that's what I can think of as I sit here today.

Q And you mentioned propane -- gasoline-propane as a dual fuel engine combination that you have worked on; is that correct?

A Yes.

Q What is propane?

A Propane is a hydrocarbon. It has three carbon atoms.

1 **Q Are you familiar with the abbreviation**
2 **LPG?**
3 A Yes.
4 **Q What does "LPG" stand for?**
5 A Well, in the context of the '398 patent
6 and the context of propane systems, it refers to
7 liquid petroleum gas.
8 **Q What is liquid petroleum gas?**
9 A It is mostly propane, but it can
10 contain other hydrocarbons as well. But it is
11 almost entirely propane, generally speaking.
12 **Q What other hydrocarbons can be**
13 **included?**
14 A So butane is maybe the next most common
15 that you see. There's others that could be
16 included in different amounts. So there's not
17 one specific answer.
18 **Q Is there a reason that LPG sometimes**
19 **includes other hydrocarbons besides just propane?**
20 MR. STEMLER: Objection. Form.
21 Relevance.
22 A There may be many reasons. I'm sure

there's a reason.

Q Are there any reasons that you're familiar with?

A Yes.

Q What are those reasons?

A So from a fuel production standpoint, it can be expensive to get to a very high purity of a specific hydrocarbon.

So if you want something that is 100 percent propane or 100 percent methane, the extra effort that is needed to go from 98 percent propane to 100 percent propane or 98 percent methane to 100 percent methane can be prohibitively expensive and not worth the effort.

So, instead, we use what is called "natural gas" that is almost entirely methane and what is called "LPG," which is almost entirely propane, because the extra effort to get higher purity fuels is not worth the performance benefit from using those fuels. I think that's one of the reasons why LPG is used instead of propane.

Q Is there a performance difference when

using LPG versus pure propane in an engine?

A So the combustion characteristics between pure propane and LPG will be very similar, but not exactly the same.

Q When you say "very similar," can you clarify kind of what scale we're talking about?

A I mean, I think if you have an LPG that's 99 percent propane, then it will be 99 percent similar to propane in terms of its combustion characteristics, generally speaking.

It's more complicated than that, and depends upon which characteristics you're talking about. But I'm not able to provide a detailed quantitative scientific answer from memory as I sit here.

Q And you testified earlier that you had experience on a dual fuel engine that could run on gasoline or propane.

Were you referring to pure propane in that case?

A Well, the generator in -- or the engine in question in that case certainly could have run

on pure propane. But my expectation is that it was always operated on LPG, which is almost pure propane, but not pure propane.

Q Do you have an understanding of different uses for LPG?

MR. STEMLER: Objection. Relevance.

A Yes.

Q What is your understanding of different uses for LPG?

A So it's primarily used as a fuel. And it can be used as a fuel in many different applications. It can also be used as a working fluid for industrial processes where its phase-change characteristics are appropriate for the application. And it is sometimes used as a refrigerant, although I guess that's a subcategory of the previous category that I just mentioned.

Q What are some types of applications that LPG can be used as a fuel for?

A So it can be used as a fuel for cooking appliances, for residential heating applications,

1 also for commercial and industrial heating
2 applications. It can be used as a fuel for an
3 engine to power a vehicle, to power a generator,
4 to power some other kind of industrial equipment.
5 It can be used as a fuel for decorative
6 flames. It can be used as a fuel for flames for
7 special effects or for shows. There's probably
8 additional applications beyond the list that I
9 gave.
10 **Q You said that LPG can also be used as a**
11 **working fluid for industrial processes, based on**
12 **its phase-change characteristics.**
13 **Can you explain what that means?**
14 A Well, there are different industrial
15 processes that rely on a phase change for the
16 application.
17 So two examples that I'm thinking of is
18 refrigeration, where you have the refrigerant
19 that at some portion in the refrigeration cycle
20 is a liquid and at some portion it's a gas.
21 And depending on the temperatures that
22 you're using in your refrigeration cycle, that

may dictate what pressure and temperature you want the working fluid to change its phase at. And that might motivate the use of propane or LPG as a refrigerant.

Another industrial application that relies on phase change is the use of a turbine for power generation. So a classical example is a steam turbine, where you boil water to generate steam and that steam powers the turbine. And then as part of that cycle, you recondense that steam back into water and then you reboil that water. So water is your working fluid and you're relying on a phase change.

But depending on the temperature characteristics of your particular power plant and the performance characteristics of the turbine that you're pushing, there are situations where propane is a more appropriate working fluid than water.

Those are two examples of where propane or LPG could be used as an industrial fluid based on its phase change properties.

1 I'm sure there are other scenarios as well.
2 **Q You testified that one use of LPG is as**
3 **fuel for cooking or heating appliances.**
4 **Is that correct?**
5 A Yes. That's one use.
6 **Q How is LPG typically stored for those**
7 **use cases?**
8 MR. STEMLER: Objection. Form.
9 A It can be stored in different ways. I
10 think most commonly propane is stored as a liquid
11 under pressure for residential and commercial
12 use.
13 **Q And just to clarify, you used the word**
14 **"propane" in your answer. But you were referring**
15 **to LPG and not necessarily limiting it to pure**
16 **propane.**
17 **Is that correct?**
18 A Yeah. In the context of that answer,
19 either -- it would apply either to propane or to
20 LPG. And I will say it's very common in the
21 industry to refer to something that is 99 percent
22 propane as "propane." So it wouldn't be

1 incorrect to refer to a propane cylinder
2 underneath my grill or the propane tank at my
3 house. In fact, that would be just as commonly
4 used as referred to LPG.
5 **Q Just to make sure we're on the same**
6 **page with the terminology, if you wanted to refer**
7 **to pure propane, you would then distinguish**
8 **specifically that you were talking about pure**
9 **propane in that context?**
10 A I think if I was giving an answer where
11 the, you know, purity of propane was important,
12 then I would specify I'm talking about pure
13 propane.
14 But generally I would use the word "propane"
15 in the course of my work essentially
16 interchangeably with LPG, and I'd be referring to
17 something that is used residentially and
18 commercially as a fuel that is almost but not
19 quite 100 percent propane.
20 **Q You mentioned that propane is stored as**
21 **a liquid under pressure; is that correct?**
22 A That's one way it can be stored. Yes.

Q Do you have an opinion, an understanding as to why propane is stored as a liquid under pressure?

MR. STEMLER: Objection. Relevance.

A Yes.

Q What is that understanding?

A Because the volume of the fuel is significantly lower when it's stored as a liquid. So it's for practical considerations.

Q And why is it stored as a liquid under pressure? What is the importance of the pressure?

MR. STEMLER: Objection. Form.

A Well, because of its vaporization properties, the only way you could store it as a liquid without it being pressurized would be if you had very low temperatures that would not be practical.

Q When you say "its vaporization properties," what are you referring to?

A So I am referring to its saturation curve. I'm referring to its saturation curve.

1 **Q What does that mean?**
2 A So saturation curve is a material
3 property that identifies the temperature and
4 pressure at which a phase change occurs.
5 So the saturation curve, it's a function of
6 both pressure and temperature, and it's the
7 pressure temperature characteristics where the
8 particular material can exist as both a liquid
9 and a gas.
10 **Q You gave the example earlier of a**
11 **propane tank underneath a grill at home. And**
12 **that tank, is it your understanding that the**
13 **propane would be stored as a liquid under**
14 **pressure as well?**
15 MR. STEMLER: Objection. Form.
16 A A typical residential use of a 20-pound
17 propane cylinder, which is the size that is
18 typically used for a grill, the propane is --
19 it's stored as a liquid at the saturation
20 pressure. So it's actually -- in the cylinder,
21 it's both a liquid and a gas. So it's liquid,
22 but it's also gas in the cylinder.

1 **Q Just to make sure I'm understanding**
2 **correctly, is it that some of the propane in the**
3 **cylinder is liquid and some is gas or is it that**
4 **all of the propane is both liquid and gas?**
5 A Some of the propane is in the liquid
6 phase and some of the propane is in the gas phase
7 in a typical residential 20-pound propane
8 cylinder.
9 **Q And what is the relative positioning of**
10 **the liquid and gaseous phase propane in the**
11 **cylinder?**
12 MR. STEMLER: Objection. Form.
13 A That depends upon the -- so the
14 fraction of liquid versus gas propane in a
15 propane cylinder depends upon the fill level of
16 the cylinder, so it can vary.
17 **Q And physically speaking, is it fair to**
18 **say that the gas propane is situated on top of**
19 **the liquid propane in the tank?**
20 MR. STEMLER: Objection. Form.
21 A Yes. Under typical conditions, yes.
22 **Q Other than a typical residential**

1 **propane cylinder, are you familiar with other**
2 **ways that propane is stored?**
3 MR. STEMLER: Objection. Relevance.
4 A Yes.
5 **Q What other ways are you familiar with?**
6 A So propane can be stored in a
7 compressed gas cylinder, where it's not a liquid.
8 It's just a compressed gas.
9 It can be stored in different size tanks
10 where it's stored as -- it might say stored as a
11 liquid, but it's actually liquid and gas, so it's
12 different sizes of tanks that can be used.
13 I mean, it's really not stored in a form
14 other than inside some kind of pressure vessel
15 and stored as, you know, either entirely gas or
16 some combination of liquid and gas.
17 There may be other sort of fringe cases
18 where it's stored in different ways. But,
19 generally speaking, whether it's for industrial
20 use or residential use or commercial use, it's
21 stored in some kind of pressure vessel.
22 **Q And going back to the typical**

residential grill, that would operate on the gaseous propane, correct?

MR. STEMLER: Objection. Form.

A Yeah, I'm not sure what you're asking when you say "that would operate."

Q Let me restate the question.

Referring to a residential grill attached to a 20-pound residential propane cylinder which contains both liquid and gaseous propane, does the grill operate on liquid propane or gaseous propane?

MR. STEMLER: Objection. Form.

A Okay. Well, so if we're imagining a typical residential grill, it has a cylinder that stores propane. And if we imagine that there's enough propane in there that there's some liquid and some gas, so at some point, you might have just gas propane if you're close to running out of propane.

The way that a typical residential grill works is there's a connection to the top of the propane cylinder, and so it's drawing propane

that's in the gas phase out of the cylinder. And as it's doing that, then there are additional molecules of propane that are vaporizing from the liquid phase. So you could also get some liquid phase propane moving through the gas line. At the point where the combustion is occurring, the propane would be in the gas phase.

Q You said in that instance, there is a connection at the top of the propane cylinder, so it's drawing propane in the gas phase; is that correct?

MR. STEMLER: Objection. Form.

A Yes. So the different applications do it different ways, but a residential grill is going to be drawing propane from the vapor space of the tank.

Q Are you familiar with any applications that draw propane from the liquid space in the tank?

MR. STEMLER: Objection. Form. Relevance.

A Generally, yes.

Q Can you give me an example of an application that draws propane from the liquid space in the tank?

A So I don't know if I can give you a specific example. The motivation to draw fuel from the liquid phase would be if your application, you wanted a higher mass flow rate of propane. And because the density of propane is higher when it's in the liquid phase, then that might cause you to draw it from the bottom of the tank.

So that would generally be the reason.

Q I think I understand what higher mass flow rate means. But could you explain what that means to you, please.

A So mass flow rate is the flow rate of something measured by how much of it in terms of mass moves past a certain point per unit time.

Q So when you're drawing liquid propane from a tank, a higher density of mass is flowing past a certain point as compared to gaseous propane?

A Not necessarily. You could certainly have a situation where the mass flow rate of a liquid was lower than the mass flow rate of a gas. But generally speaking, because liquids are significantly denser than gases, the mass flow rate of a liquid is higher than the gas -- than the mass flow rate of a gas, if you have the same volume flow rate. That's generally true. It's generally true of propane. It's not always true.

Q When a system draws liquid propane from the bottom of the tank, is that liquid propane typically vaporized before it's combusted?

MR. STEMLER: Objection. Form.

A Okay. So if I imagine a hypothetical scenario where I am drawing liquid propane from the liquid phase of a tank, so I have a tube that's going down towards the liquid phase, and ultimately I'm using that propane for some kind of combustion application, the propane is going to be vaporizing along that path.

So, actually, even as it's being drawn up out of the tank, there is going to be liquid and

vapor. But -- and in all combustion applications I can think of, by the time you get to where the combustion is occurring, that's happening with propane in the gas phase, although I suppose you could have an application where the combustion is happening to propane in its liquid phase.

For the combustion process to actually work, combustion actually only works with something in the gas phase. But that vaporization may be happening just right at the point of combustion.

So I guess that's a long way of saying it depends on the application.

Q You mentioned that as liquid propane is drawn from a tank, because of the characteristics of liquid propane, some portion of it begins vaporizing pretty much immediately.

Is that accurate?

MR. STEMLER: Objection. Form.

A So I'm imagining a scenario where I have a liquid withdrawal line that extends down into a pressurized tank that has both liquid and gas propane.

1 And if you're drawing liquid, as it's moving
2 up that tube, you're immediately inside that tube
3 going to have some vaporization of the liquid
4 propane. Yes.
5 **Q You mentioned earlier some applications**
6 **require a higher mass flow rate than others.**
7 **Is that correct?**
8 MR. STEMLER: Objection. Form.
9 A Yes. That's generally true.
10 **Q Are you familiar with any applications**
11 **of propane that require a higher mass flow rate?**
12 A Well, the application that I'm most
13 familiar with is when you are transferring
14 propane.
15 So if you are filling a tank or emptying a
16 tank, it is more efficient to do that with
17 propane in the liquid phase.
18 Of course, you can't do it where it's all in
19 the liquid phase because you're going to have
20 some vapor. But it's quicker to do that transfer
21 process if it's in the liquid phase, if the
22 propane is in the liquid phase.

1 Now, that's the application that I most
2 commonly come up against, but there would be
3 other applications as well where you might want
4 propane in a liquid phase for mass flow rate
5 considerations.
6 **Q Other than transfer of propane, are you**
7 **familiar with any other applications where you**
8 **might want propane in a liquid phase for mass**
9 **flow rate considerations?**
10 MR. STEMLER: Objection. Form.
11 Relevance.
12 A So there's also applications where you
13 want propane in a liquid phase because of its
14 phase change properties, and I talked about it
15 before. So that's not where your motivation to
16 have it in a liquid phase is driven by mass flow
17 rate considerations. Instead, it's driven by the
18 phase-change characteristics.
19 I guess I would like to have an
20 understanding of the kind of applications where
21 you would want the propane in the liquid phase
22 for mass flow rate considerations besides for

heat transfer or for just physical transfer. But there's not a specific project that I worked on that I think of as I sit here.

Q Do you have a general understanding of the kinds of applications where that's true?

MR. STEMLER: Objection. Form.

A Yes. So it's just any situation where the mass flow rate that is achievable by drawing propane from the vapor phase may not be high enough, that might motivate you to draw it from the liquid phase.

Again, it will be liquid and vapor, but if you're getting some liquid, you have a higher mass flow rate, generally speaking.

Q Why would you want a higher mass flow rate?

A I mean, because you want more propane faster.

Q Are there any combustion engines that you're aware of that require propane in a higher mass flow rate?

A The mass flow rate that is required for

a particular engine will depend upon the engine characteristics.

Q Are there any specifically that you are aware of that require a higher mass flow rate than can be achieved with gaseous propane?

MR. STEMLER: Objection. Form.

A I mean, I don't think that's the way that I would put it. Because you can achieve essentially -- there's really no limit to the flow rate you could achieve with propane in the gas phase.

I'm not recalling a specific instance as I sit here, but it is straightforward for me to imagine as an engineer an application where, based on the specific considerations of the application, that the best way to flow propane is to have it in its liquid phase.

Again, it would be liquid and vapor phase. And that would just have to do with the specific characteristics of the application, which wouldn't necessarily just be having to do with the engine.

Q When you said there's no limit to the flow rate you can achieve with propane in the gas phase, what did you mean by that?

A So there's no practical upper bound. I suppose at some point, we could think through the engineering challenge, especially the laws of physics.

If you want a higher flow rate, you can just have a bigger pipe or you can just have a bigger pressure difference driving it or you can increase the pressure such that even though you're still in the gas phase, the density of the gas is much higher.

So there are lots of ways to achieve a higher flow rate of propane while it's purely in the gas phase.

Q So it's fair to say that there are design characteristics that go into a particular application that would lead the designer to choose whether or not to use propane in gaseous phase or a liquid phase?

A Yeah. I think --

MR. STEMLER: Objection. Form.

A I think the decision of how to configure the transfer piping and all the associated equipment is dictated by the specific application. And there are specific applications where having liquid propane instead of purely vapor propane flowing through a line may be advantageous.

MR. STEMLER: Counsel, whenever it's convenient, if we can take a quick break, I appreciate it.

MR. FINCH: Sure. Can we do maybe five more minutes?

MR. STEMLER: Sure. I have got 5 percent battery on this monitor. So I was hoping we could get a charger.

MR. FINCH: Let's go ahead and do a five-minute break or a ten-minute break.

(A recess was taken.)

BY MR. FINCH:

Q Dr. Morse, have you ever personally seen a combustion engine that relies on a higher

1 **mass flow rate of propane than could be achieved**
2 **with gaseous propane?**
3 MR. STEMLER: Objection. Relevance.
4 A I don't recall personally seeing an
5 application where there was an intention to have
6 liquid propane flowing from a tank because of
7 mass flow rate considerations for an engine.
8 **Q Okay. Have you seen engines where**
9 **there was an intention to have liquid propane**
10 **flowing from a tank for other reasons or other**
11 **considerations?**
12 MR. STEMLER: Objection. Relevance.
13 A So I've regularly seen transfer
14 operations where liquid propane is flowing.
15 **Q Referring specifically to engines, have**
16 **you ever seen an engine where there was an**
17 **intention to have liquid propane flowing from a**
18 **tank?**
19 MR. STEMLER: Objection. Relevance.
20 A Well, so in a propane system, if a --
21 if propane is being drawn from a tank and the
22 flow rate of propane is higher than the

1 vaporization rate can make up the propane, then
2 there's the possibility of getting some liquid
3 propane into a fuel line that may be originally
4 intended to have only propane in the vapor phase.
5 And that's something that I've seen before.
6 **Q And so you said vaporization rate. And**
7 **I understood your answer to say that there are**
8 **instances where it's not possible to draw gaseous**
9 **propane out of a tank faster than the liquid**
10 **propane in the tank is vaporized.**
11 **Is that correct?**
12 MR. STEMLER: Objection. Form.
13 A I don't know if I put it exactly like
14 that. But, yeah, generally that's something that
15 can occur, is known to occur, and I've seen that
16 occur.
17 **Q And so if you had an application that**
18 **used a large amount of gaseous propane, depending**
19 **on the piping and other considerations, there may**
20 **be a problem with it unintentionally drawing**
21 **liquid propane out of the tank due to that**
22 **vaporization rate?**

1 MR. STEMLER: Objection. Form.
2 A Yeah. The only thing that I would
3 disagree with that is the word "unintentionally,"
4 because there are applications where things are
5 sized, and the design plan is that the flow of
6 propane in the line from the tank to the
7 application, such as an engine, is purely in the
8 vapor phase.
9 But it's known that, hey, if we really are
10 cranking up the usage and it's a particularly
11 cold day, we might have situations where we're
12 getting some liquid propane that's getting drawn
13 up and, hey, we can tolerate some of that as long
14 as it's not too much and it's vaporizing before
15 it gets to our engine.
16 But then at some point, there may be a
17 situation where it's too cold or the usage too
18 high, and so you're not able to supply the flow
19 rate of propane that you need. Then you can't
20 continue to run the equipment, whether it's an
21 engine or something else.
22 So that's the kind of scenario that I am

1 used to, where it's a known issue that limits
2 your maximum rate of fuel usage. So it's not
3 necessarily unintentional. It's just the known
4 limit that you're bumping into.
5 **Q So drawing gaseous propane from a tank**
6 **is what creates that known limit in terms of the**
7 **amount of fuel that can be used?**
8 A I mean, it's not the drawing of the
9 vapor -- of the propane in the vapor phase. It's
10 really just because vaporization is a cooling
11 process, you might just not have enough ambient
12 heat to keep up with the vaporization and so you
13 end up drawing liquid propane into your transfer
14 line.
15 **Q In the situation you referred to**
16 **earlier where, because of this issue, you can't**
17 **continue to run the equipment, what would be the**
18 **solution to that problem?**
19 MR. STEMLER: Objection. Form.
20 A So I mean, it depends upon the specific
21 application. A typical approach that's used is
22 to add external heat.

Q And what specific application would that be used for?

A So, like, it varies. And you might not use it. You might use it. But if you have an application where you have a high rate of propane flow and the vaporization is not able to keep up so you're not getting the pressure that you need to drive your application, one solution that can be implemented, and is implemented often, is to add external heat to increase the rate of vaporization.

Q When you say "add external heat," how is that done, in your experience?

A So it can be done in a number of different ways.

Q What are the ways that you are aware of?

A So one way is to add electrical heating to the piping or to the tank. So you wrap the piping in some electrical heating or you have, like, a heating pad on the tank.

There's other applications where you maybe

are relying on heat from some other external source of heat and using some heat transfer fluid to get that heat to your propane piping.

Q And in addition to the ambient or natural vaporization of liquid propane that happens at typical pressures and temperatures, can you also use a vaporizer to convert liquid propane into gaseous propane?

MR. STEMLER: Objection. Form.

A So a vaporizer in the context of a propane system typically refers to a device that is designed to have an external source of heat to provide heat to propane to maintain a certain rate of vaporization.

Q When you say "certain rate of vaporization," can that be faster than the rate of vaporization that would naturally occur inside of a propane tank?

MR. STEMLER: Objection. Form.

A So I think in that kind of an application where you're using a vaporizer, you're not thinking of only the vaporization

that's happening inside the propane tank but of vaporization that could happen throughout the system. But the idea is that you're adding external heat to increase the rate of vaporization.

Q And increase it from what would happen inside of a propane tank without any external forces applied?

A Well, again, I wouldn't say inside a propane tank. I mean, you could imagine the system.

So the propane tank, the piping, whatever device is using it, and thinking about the vaporization that's happening over the course of it, and if that is not going to be high enough, then one solution is to add external heat.

And one way to do that is with something that's often called a "vaporizer" that is specifically designed to take external heat to increase the rate of vaporization.

So it's not just the vaporization that is happening in the propane tank. It's what would

be happening throughout the system that you're considering.

Q So use of a vaporizer would be one solution to the problem you mentioned earlier, where an engine isn't drawing enough gaseous propane?

A I guess the distinction I would make is that I think of a vaporizer as something that you include when you expect over a range of use conditions you're going to need that extra heat, and so you have something that's designed to provide that extra heat.

I think before I was talking about -- or at least in my mind, I was thinking about an application where, most cases, you don't need the external heat. But on a particularly cold day, you're trying to get something to work, and now you have a problem and so you have a more ad hoc solution.

A vaporizer may be more of an engineered solution to the issue of not having insufficient [sic] rate of vaporization in a propane system.

1 **Q So the issue of not having insufficient**
2 **rate of vaporization, was that an unintentional**
3 **double negative there?**
4 A Yeah. I don't know how it's being
5 transcribed, but I probably said "a efficient" or
6 "an efficient" rather than "inefficient." So I
7 don't think I intended a double negative.
8 **Q Have you ever worked on or seen an**
9 **engine that draws liquid propane from a tank, for**
10 **any reason?**
11 MR. STEMLER: Objection. Form.
12 A So I personally worked on a project
13 where an engine was drawing liquid propane from a
14 tank, but that was under sort of off-typical
15 usage conditions.
16 **Q When you say "off-typical usage**
17 **conditions," what do you mean?**
18 A So, I mean, the project I'm thinking of
19 is a system that was operating under propane, but
20 when the ambient temperatures were really cold,
21 then the vaporization rate couldn't keep up and
22 so external heat sources had to be applied.

And that was a scenario where there was liquid propane being drawn from the tank.

Q Have you ever seen an engine that was intentionally drawing liquid propane from a tank?

A Again, I mean, like, it's -- while that was a nontypical operation condition, it wasn't, like, unexpected or, like, unheard of. So it was maybe outside of the normal operating window.

But I don't think I've worked on a project where an engine under its normal operating window was drawing liquid -- propane in a liquid phase from a tank. I don't recall such a project as I sit here.

Q Going back to our residential grill example which draws gaseous propane from the top of a tank, if you change the connection so that it was drawing liquid propane from the bottom of the tank, without changing anything else about the system, would that be problematic?

MR. STEMLER: Objection. Form.

A I think that under most circumstances, it would work just fine. There may be some

1 conditions, and it would depend on the specifics
2 of the appliance, where you might have a problem
3 operating the -- operating the grill.
4 **Q What problems would occur?**
5 MR. STEMLER: Objection. Form.
6 A So it's not necessarily true that you
7 would have problems. I think it would be under
8 certain circumstances you could have problems.
9 **Q What problems could you have, and in**
10 **which circumstances would they occur under?**
11 A So the problem that I'm thinking about
12 is -- and it would depend upon the application,
13 so you could have an application where what I'm
14 describing would not come up.
15 But you might have a situation where the
16 time that it took for the liquid propane to
17 vaporize -- because it would be vaporizing all
18 the time, as you pulled it, even though you're
19 pulling it from the liquid phase -- that time,
20 depending on the specific application, might be
21 too long for all of the propane to vaporize
22 before it gets to the regulator. And so as a

1 result, there may be liquid propane getting
2 through the regulator.
3 And the problem with that is then there
4 would be additional vaporization downstream of
5 the regulator, and that could throw off the
6 pressure in the gas line.
7 That is one example of something that could
8 happen, hypothetically, given the right
9 conditions.
10 **Q If you have an engine that's designed**
11 **to operate on gaseous propane and you instead**
12 **draw liquid propane from the bottom of a tank,**
13 **what would happen?**
14 MR. STEMLER: Objection. Form. And
15 objection, scope. Again, Counsel, could you
16 direct us to where in the declaration this
17 question comes from or relates to?
18 MR. FINCH: The '398 patent
19 specifically refers to liquid and gaseous propane
20 at multiple -- liquid and gaseous fuels at
21 multiple points in time. And it's an engine
22 operable on liquid and gaseous fuels. And so I'm

1 trying to get an understanding of the expert's
2 understanding of the operating conditions of
3 various liquid and gaseous fuels.
4 MR. STEMLER: I think the deposition is
5 specifically contained to the declaration,
6 though. Not any topic that may be relevant to
7 the '398 patent.
8 BY MR. FINCH:
9 **Q Let me ask a different question.**
10 **Dr. Morse, in your declaration -- or as part**
11 **of the analysis that went into your declaration,**
12 **did you consider the impact on whether liquid or**
13 **gaseous propane exists at various points in the**
14 **systems described by the prior art?**
15 A That may be something I considered.
16 I'd have to go to my declaration to refresh my
17 memory.
18 **Q Without looking at your declaration,**
19 **you don't know whether or not you considered the**
20 **impact of gaseous or liquid propane at various**
21 **points in the system, as described by the prior**
22 **art?**

MR. STEMLER: Objection. Form.

A I guess I don't know what you mean by "impact." I reviewed the '398 patent and the claim elements and provided my analysis on how prior art references met those claim elements.

So insofar as there are claim elements that address liquid versus gaseous fuel, that is something that I considered, but in the context of the -- for my declaration, in the context of my analysis of the claims of the '398 patent.

Q When you consider a prior art engine, do you think it's relevant whether propane is in a liquid or gaseous fuel -- form at various points in the system?

MR. STEMLER: Objection. Form.

A So are you asking about the '398 patent?

Q When you consider an engine disclosed by a piece of prior art, do you think it's relevant whether the prior art discloses propane in a liquid or gaseous form at particular points in the system?

A I mean, that depends upon the particular analysis I'm doing. So if we're talking about a specific claim in the '398 patent, then we can look at that claim and see if it's relevant or not.

Q Did you consider whether or not a prior art system disclosed liquid or gaseous fuel while preparing your declaration today -- that is at issue today?

A So my recollection is that I did some analysis along those lines in the context of the claims of the '398 patent.

There may have been some prior art references that was not part of my analysis, just based on the specific claims that I was looking at.

Q If you have an engine that's designed to operate on gaseous propane and you instead draw liquid propane from the bottom of a tank, what would happen?

MR. STEMLER: Objection. Form. Scope.

A That depends upon the specific engine

and the system that's being evaluated.

Q Are you aware of any problems that could be caused by drawing liquid propane instead of gaseous propane from a tank?

MR. STEMLER: Objection. Form. Scope.

A The specific problems that could arise would depend upon the specific engine being evaluated and the specific configuration of the propane system.

Q Sitting here today, are you aware of any problems that could be caused by drawing liquid propane instead of gaseous propane from a tank in the context of an engine?

MR. STEMLER: Objection. Form. Scope.

A I think your question is too broad for me to give you an answer. If you want to give me a specific engine and a specific configuration, then to the extent I'm able in real time here, I can give you issues that might arise. But I think as you put it, that's too broad for me to answer, as I sit here.

Q Are you aware of any engines where

changing a gaseous fuel source for a liquid fuel source would cause problems with the engine?

MR. STEMLER: Objection. Form. Scope.

A So when you say in this question "a gaseous fuel source for a liquid fuel source," are you saying from propane, i.e., a gaseous fuel source, to gasoline, a liquid fuel source?

Is that what you're asking?

Q No. Let me restate the question.

Are you aware of any engines where changing the fuel source from gaseous propane to liquid propane would cause problems for the engine?

MR. STEMLER: Objection. Form. Scope.

A I'm not sure what you mean in that question because propane will change -- can change phase from a liquid to a gas as it flows through a system. So where in the system specifically are you talking about?

Q You testified earlier that you worked on a dual fuel gasoline-propane engine, correct?

MR. STEMLER: Objection. Form.

A Yes. I have worked on a previous

1 project that involved an engine that could run on
2 both propane and gasoline.
3 **Q Did that engine draw liquid propane**
4 **from the source or gaseous propane from the**
5 **source?**
6 A My recollection on the project I worked
7 on is that the system was configured to draw
8 propane in the gaseous phase from the tank.
9 **Q With that system in mind, if you**
10 **modified it to instead draw liquid propane from**
11 **the tank, would it cause any problems?**
12 MR. STEMLER: Objection. Form.
13 Relevance. Scope.
14 A So how are you suggesting modifying it
15 so that it's drawing liquid propane from the
16 tank?
17 **Q We discussed earlier that you can draw**
18 **gaseous propane in the top of a propane tank or**
19 **liquid propane from the bottom of a propane tank,**
20 **correct?**
21 MR. STEMLER: Objection. Form.
22 A I mean, those are two examples of

1 configurations that can be used.
2 **Q So with the system that you discussed a**
3 **moment ago in mind, if you modified it to draw**
4 **liquid propane from the bottom of the propane**
5 **tank, would that cause any problems to the**
6 **engine?**
7 MR. STEMLER: Objection. Form.
8 Relevance. Scope.
9 A In the example project that I'm
10 thinking of, I don't think that would have caused
11 any problems. I don't think so. As I sit here,
12 I don't think it would have caused any problems.
13 **Q Why not?**
14 A Because in the application I'm thinking
15 of, the configuration was such that there -- that
16 the engine would have worked fine if the geometry
17 was changed to have a tube that extended into the
18 liquid phase of the propane tank.
19 MR. FINCH: I hand you a document
20 previously marked as Exhibit 1005.
21 (Previously marked Exhibit 1005
22 incorporated by reference.)

BY MR. FINCH:

Q Dr. Morse, are you familiar with this document?

A Yes.

Q To your understanding, what is this?

A I refer to this as the Nakafushi reference. It's a Japanese patent for a gasoline-LPG combined engine.

Q And this is -- Exhibit 1005 is a translation, correct?

A Yes.

Q Did you review the original document?

A I did, yes.

Q Do you speak Japanese?

A I do not, no.

Q So you relied on this translation for your opinions?

MR. STEMLER: Objection. Form.

A Generally, that's right. I think I looked at the figures in the Japanese version.

Q What was your reasoning for looking at the figures in the Japanese version?

A Just to confirm that the figures in the translated version were the same.

Q And everything appeared to line up correctly?

A That's what I was looking for. Yes. Looking for any deviations.

Q Page 1 of the document, it says, title of the invention, "Gasoline-LPG combined engine." Do you see that?

A Yes.

Q Is that consistent with your understanding that this generally relates to a gasoline-LPG combined engine?

A Yes.

Q Combined engine, is that the same as the general concept of a dual fuel engine we were discussing earlier?

MR. STEMLER: Objection. Form.

A Well, I'm not sure the word "combined" -- or the phrase "combined engine" by itself provides enough understanding, but reading the patent, it refers to an engine that is

configured to selectively use gasoline or LPG, which is the same as the '398 patent.

Q And an engine configured to selectively use gasoline or LPG, would you refer to that as a dual fuel engine?

A Yes. That's a way it could be referred to. Yes.

Q The engine disclosed in the Nakafushi reference, do you know what it's used for?

MR. STEMLER: Objection. Form. Relevance.

A I don't recall as I sit here. I'd have to look at my declaration or the document.

Q Feel free to take a look at the document.

Do you have an understanding of what this engine is used for?

A As I review this reference, I don't see it identifying any specific application for the engine. There --

Q Okay. Do -- sorry. I didn't mean to cut you off.

A There may be additional analysis in my declaration.

MR. FINCH: I hand you a copy of your declaration previously marked as Exhibit 1003 here.

(Previously marked Exhibit 1003 incorporated by reference.)

BY MR. FINCH:

Q Feel free to take a moment to review your declaration. But the question is: Do you have an understanding of what the engine disclosed by Nakafushi is used for?

A So I don't see anything in my declaration, I don't believe, as I sit here, that the Nakafushi reference identifies a specific application for the engine it discloses.

Q Earlier today we talked about displacement as one measurement of the size of an engine.

Do you have any understanding of what the displacement of the engine disclosed by Nakafushi is?

A I don't think Nakafushi is limited to any specific engine displacement.

Q So the -- so is it -- when you say "not limited to any specific engine displacement," what do you mean?

A A person of ordinary skill in the art reading Nakafushi would know that it could apply to an engine on the smaller side and an engine on the bigger side, that it's not limited to any specific engine size.

Q And what is it about Nakafushi that leads a person of ordinary skill in the art to that understanding?

A Well, a person of ordinary skill in the art would be familiar with engines generally, and engines come in different sizes. And there's nothing about Nakafushi that limits it to only work with certain specific size engines.

Q Turn to page 10 of Nakafushi. That's Figure 1. And No. 11 here is labeled as a "gasoline tank."

Is that correct?

MR. STEMLER: Objection. Form.

A Yes. Looking at Figure 1 of Nakafushi, No. 11 is pointed to an element that is labeled "gasoline tank."

Q That is -- what is your understanding of a "gasoline tank" in this context?

MR. STEMLER: Objection. Form.

A It's a tank that holds gasoline.

Q And you said this is a gasoline-LPG combined engine. So is it fair to say that when it's operating on gasoline, it would be drawing fuel from that gasoline tank 11?

A Yes. That's my understanding of how Nakafushi works.

Q And going from the gasoline tank towards the engine, I just have a couple of questions about some of the components in between. So the next number listed is 10, and it's a filter.

What is a filter in this context?

A So I don't see any further description in Nakafushi. I think a person of ordinary skill

in the art would understand that filter to be something that filters out impurities from the gasoline as it is flowing from the gasoline tank.

Q And what types of impurities would be in the gasoline?

MR. STEMLER: Objection. Form.

A So I don't think Nakafushi is specific to any particular impurity.

Q Generally speaking, why would a person of ordinary skill in the art use a filter in a gasoline line such as the one disclosed by Nakafushi?

A To filter out impurities in the gasoline that resides in the gasoline tank.

Q Why is it important to filter out impurities in the gasoline?

MR. STEMLER: Objection. Form.

A So, generally speaking, for internal combustion engines, the presence of impurities can negatively impact the combustion or cause degradation of other components of the engine.

Q How does a filter such as the one

1 **disclosed here operate?**
2 A So I don't think that the filter in
3 Nakafushi is specific. Different filters operate
4 in different ways.
5 **Q As a person of ordinary skill in the**
6 **art, what sort of filter would you expect to use**
7 **in a situation such as this?**
8 A So I think a person of ordinary skill
9 in the art would know to choose the type of
10 filter that's relevant for the application that
11 they're building this engine for.
12 **Q What type of filters are relevant to a**
13 **dual fuel engine operable on gasoline?**
14 A It depends upon the characteristics of
15 the gasoline that's being used.
16 **Q If you were implementing a dual fuel**
17 **engine in a generator, what sort of filter would**
18 **you use here?**
19 MR. STEMLER: Objection. Form.
20 A I think it would depend upon the
21 specific characteristics of the engine and the
22 gasoline that I was using.

1 **Q Nakafushi discloses an engine, correct?**
2 A Yes.
3 **Q Okay. What sort of filter would you**
4 **use in the context with the engine disclosed by**
5 **Nakafushi?**
6 A I'm just reviewing Nakafushi just to
7 make sure I'm giving you an accurate as possible
8 answer to your question.
9 So I don't see anything in Nakafushi that is
10 specific about the gasoline that's being used.
11 And I think that the selection of a filter is --
12 would be driven by the characteristics of the
13 gasoline being used.
14 **Q What different types of gasoline could**
15 **be used in an engine such as the one disclosed by**
16 **Nakafushi?**
17 A Well, it would -- the filter selection
18 really has to do with the impurities that you
19 expect in the gasoline.
20 **Q What impurities would you expect in**
21 **gasoline?**
22 A So it depends upon the specific

application, but typical impurities would be particulates and water.

Q What type of filter would you use to filter out particulates and water?

A Well, you'd use a different one for particulates than for water. And the typical -- the specific one that you would use depends on the types of particulates that you expect.

Q What types of gasoline are typically used for dual fuel engines?

MR. STEMLER: Objection. Form. Relevance.

A I don't know that there's a typical. There's a range that could be used. The answer might depend upon where the engine is being used.

Q When you say "where the engine is being used," what do you mean?

A Well, different locations, both in the U.S. States and internationally, use different amounts of ethanol in gasoline. So depending on location, you may be using more or less ethanol in the gasoline.

Q Does the amount of ethanol in the gasoline impact which filter would be used?

A Yeah. I think it could.

Q How does the amount of ethanol in the gasoline impact which filter could be used?

A Well, I think that if you are using gasoline with a higher amount of ethanol, then just the fluid mechanic properties are different than if you're using gasoline with no ethanol. And so the specific configuration of the filter that you might use might be different.

Q The next item on this figure is labeled "9." It says "pump." Is that correct?

A So when you say "this figure," I assume you're talking about Figure 1 on page 10. And that figure shows an element identified with the word "pump" and the number 9.

Q What is your understanding of what pump No. 9 is?

MR. STEMLER: Objection. Form.

A So the pump in Nakafushi is used to draw fuel from the gasoline tank and push it

toward the carburetor.

Q Do most engines -- gasoline engines have a pump to draw fuel from the tank to the carburetor?

MR. STEMLER: Objection. Form.

A So if we're thinking about, like, the full worldwide population of engines that can run on gasoline, I would think that the majority of those engines, the gasoline flow system includes a pump.

Q The next number listed on Figure 1 is No. 17, "gasoline cut valve."

Do you see that?

A Yes.

Q What is your understanding of No. 17, "gasoline cut valve"?

MR. STEMLER: Objection. Form.

A So the Nakafushi, the gasoline cut valve is a valve that is opened or closed to either allow or block flow of gasoline to the carburetor.

Q And in situations where a gasoline cut

valve is opened, gas flows through the valve to the carburetor?

A If the gasoline cut valve is open, then gasoline can flow to the carburetor. It may not always flow to the carburetor, depending on the condition of the engine.

Q What is it about the condition of the engine that would impact whether or not gasoline would flow through the gasoline cut valve to the carburetor?

A So if the float chamber is full, then even if the gasoline cut valve is open, there won't be flow of gasoline to the carburetor.

Q What is the purpose of a float chamber?

A So are you asking about the purpose of a float chamber generally in a carburetor or are you asking about the purpose of the float chamber in Nakafushi?

Q Is the answer different?

A It may not be. I'd have to look again at Nakafushi.

Q What is the purpose of a float chamber

1 **generally in a carburetor?**
2 A It is to maintain a specific level of
3 fuel in the carburetor such that the carburetor
4 can work properly to supply the proper air-fuel
5 ratio.
6 **Q Is that the same as the purpose of the**
7 **float chamber in Nakafushi?**
8 A I would say yes, generally. There are
9 additional elements in Nakafushi that resolve an
10 issue with the typical carburetor float chamber.
11 **Q What are the additional elements in**
12 **Nakafushi that resolve an issue with the typical**
13 **carburetor float chamber?**
14 A So Nakafushi includes a control valve
15 configured to allow or block suctioning of
16 gasoline from the float chamber to the intake
17 passage.
18 **Q Why does Nakafushi include a control**
19 **valve configured to allow or block the suctioning**
20 **of gasoline from the float chamber to the intake**
21 **passage?**
22 A It's for two reasons. It's to avoid an

1 overrich air-fuel ratio when switching fuels and
2 it's to avoid a delay in the level of gasoline in
3 the float chamber when switching fuels in the
4 other direction.
5 **Q What is -- when you say an "overrich**
6 **air-fuel ratio," what do you mean?**
7 A So if you have more fuel than the
8 optimum amount of air and fuel in an air-fuel
9 mixture, that would be a rich air-fuel mixture.
10 **Q And what circumstances can result in an**
11 **overrich air-fuel ratio with respect to**
12 **Nakafushi?**
13 A Well, Nakafushi specifically talks
14 about when switching operation from gasoline to
15 LPG, depending on the configuration, you can have
16 the fuel in the float chamber be drawn into the
17 carburetor, which results in an overrich air-fuel
18 ratio. And that's one of the reasons why
19 Nakafushi talks about the control valve.
20 **Q So without the control valve, but**
21 **considering the rest of Nakafushi's Figure 1,**
22 **when switching from gasoline to LPG, is it fair**

to say that the engine would continue to burn the gasoline located in the float chamber while also burning LPG?

MR. STEMLER: Objection. Form.

A So that issue is what -- one of the reasons that Nakafushi identifies as the purpose of the control valve.

Q You also mentioned a delay in the level of gasoline in the float chamber when switching fuels in the other direction.

What did you mean by that?

A So if you don't have the control valve, then when operating the engine with LPG, the residual gasoline in the float chamber will also be drawn in, and that will lead to an overrich air-fuel ratio. We just talked about.

Then if you want to switch back, then before gasoline can flow into the carburetor, it first needs to fill the float chamber. And that delay will result in an overlean air-fuel mixture when switching back from LPG to gasoline. That's the -- one of the problems that the Nakafushi

1 invention solves with the control valve.
2 **Q What is the impact of an overrich**
3 **air-fuel ratio on an engine?**
4 MR. STEMLER: Objection. Form.
5 A It depends on how overrich it is.
6 **Q What would you consider various levels**
7 **of overrich air-fuel?**
8 A So the typical way to quantify the
9 air-fuel ratio is how far away it is from the
10 stoichiometric condition.
11 So the stoichiometric condition is where you
12 have the exact matching of molecules of fuel to
13 molecules of air, such that after combustion, you
14 have no leftover fuel and no leftover air.
15 If you have more fuel than that, then you
16 have a rich air-fuel ratio. If you have an
17 over-air-fuel ratio, that would imply that it's
18 sufficiently rich that you're starting to have
19 some issues, which could include less efficiency.
20 It could include just the engine can't run. It
21 could include additional pollutants.
22 Those are the kind of -- the kind of

negative things that can occur if you have an overrich air-fuel ratio.

Q And what kinds of things could occur if you have an under-rich air-fuel ratio?

MR. STEMLER: Objection. Form.

A So "under-rich" is not a phrase that I'm familiar with. You have to explain to me what you mean by that.

Q Sure. What term would you use to describe a situation where the fuel is less rich than it should be?

A Well, it depends. So I don't know how you are identifying how rich it should be in your question.

Q Sure. You testified earlier that an overrich air-fuel ratio refers to an air-fuel ratio above the stoichiometric condition; is that correct?

A Well, any air-fuel ratio where the amount of fuel is higher than the stoichiometric ratio is going to be fuel-rich. And "overrich" implies that it's fuel-rich to the point where

there's a problem that is arising.

Q What term would you use to refer to fuel -- where the amount of fuel is below the stoichiometric condition?

A That's typically referred to as fuel-lean.

Q Fuel-lean.

Are there problems that arise when fuel is too fuel-lean?

A Yes. There are problems that can arise.

Q What types of problems?

A So there are certain pollutants that appear when operating fuel-lean. And if you're running sufficiently fuel-lean, then you may not even be able to get the engine to run. And also typically it's harder to start an engine when you're operating fuel-lean.

Q After the control valve 23 that we talked about earlier in Figure 1, Nakafushi depicts a "carburetor" labeled "No. 1."

Do you see that?

A I see carburetor No. 1. I don't know if I agree with your characterization of that being separate from the control valve.

Q What is the purpose of a carburetor?

A A carburetor is a device that is used to mix a liquid fuel with air at a proper air-fuel ratio.

Q Is that true for the carburetor labeled "No. 1" in Nakafushi's Figure 1 as well?

A Yes.

Q Does the carburetor have any other purpose?

A So in Nakafushi, the carburetor is also connecting the gaseous fuel to the engine.

Q Generally speaking, are there any other purposes for a carburetor?

MR. STEMLER: Objection. Form.

A I mean, there may be, generally speaking. But, generally speaking, the purpose of a carburetor in an engine is to provide the proper air-fuel ratio for a liquid fuel. That's generally what it's used for. But there may be

other uses, depending on the specific application.

Q How does a carburetor in an engine provide the proper air-fuel ratio for a liquid fuel?

A So it relies on something called the Venturi effect, where a flow through a narrowing passageway results in a decrease in pressure. And it uses that decrease in pressure when air flows through a narrowing passageway to generate a suction that draws liquid fuel out of the float bowl in the carburetor.

And the -- it's sized and adjusted so that you get the right amount of Venturi effect to get the right amount of liquid fuel drawn out so that you get the right air-fuel ratio. That's generally how a carburetor works.

Q And Nakafushi's Figure 1 labeled some subcomponents of the carburetor.

Do you see labels 2a and 2b?

A Yes. I see 2a and 2b in Figure 1.

Q What is your understanding of what 2a

and 2b are?

A Those are part of Venturi. Nakafushi refers to them as Venturi portions.

Q There's also portions labeled "3a" and "3b."

Do you see that?

A Yes.

Q What is your understanding of 3a and 3b?

A Those are the throttle valves.

Q What is a throttle valve?

A So that's a valve that opens or closes to provide more or less mixed air and fuel to the engine to increase or decrease the power of the engine.

Q Nakafushi depicts what appears to be a similar valve labeled "No. 4" in Figure 1.

Do you see that?

A Yes.

Q What is the purpose of No. 4?

A 4 is the choke.

Q What is a choke?

MR. STEMLER: Objection. Form.

A So a choke is used to change the air-fuel ratio when an engine is first started. So when you start an engine, it's easier to start if you are running a little bit fuel-rich. So a choke is used to adjust the air-fuel ratio when starting the engine.

Q Nakafushi's Figure 1 also depicts numeral 7. It's labeled "LPG mixer."

What is your understanding of what label 7, "LPG mixer" is?

A That's for mixing the LPG with air.

Q What is the purpose of mixing the LPG with air?

A Well, before you combust the LPG, it needs to be mixed with air.

Q Nakafushi has a numeral 16 that it lists as "LPG cylinder." Is that correct?

A Yes.

Q What is your understanding of what LPG cylinder 16 is?

A It's a cylinder that holds LPG.

Q Nakafushi also discloses a filter 15. Do you see that?

A Yes.

Q Is that filter the same as filter 10?

A No.

Q What are the differences?

MR. STEMLER: Objection. Form.

A Well, 15 is on the LPG line and 10 is on the gasoline line.

Q Are there any other differences?

A I mean, they're both filters, and so they're both filtering the fuel. But it's different fuel that it's filtering. But, yeah, that's the difference is the fuel that they're filtering.

Q And what fuel is filtered by filter 15?

A LPG.

Q And what makes a filter for LPG different from a filter for gasoline?

MR. STEMLER: Objection. Form.

A Well, the working fluid is different. And so that affects the filter.

1 **Q How does that affect the filter?**
2 MR. STEMLER: Objection. Form.
3 A Well, the filter for the gasoline is
4 only seeing liquid gasoline, and there's no phase
5 change happening at the filter. The filter for
6 LPG is going to see -- could potentially see both
7 liquid and vapor propane. And there may be a
8 phase change that happens in the filter.
9 So if one of the goals of the filter is to
10 filter out water, an LPG filter needs to be
11 designed such that the potential for the water
12 freezing is not causing problems for the filter.
13 And that's one of the differences between a
14 filter for an LPG system and for a gasoline
15 system.
16 **Q Are there any other differences that**
17 **you're aware of, sitting here today, for a filter**
18 **between an LPG system and a gasoline system?**
19 MR. STEMLER: Objection. Form.
20 A I mean, the difference is driven by the
21 working fluid. That drives -- that's the driver
22 of the differences, the working fluid.

Q The next structure listed on Figure 1 is labeled "LPG cut valve," 18.

Do you see that?

A Yes.

Q What is your understanding of what LPG cut valve 18 is?

A That's to either open or close the flow passage of LPG toward the engine.

Q Is that the same as gasoline cut valve 17?

MR. STEMLER: Objection. Form.

A I mean, it's similar in functionality, but it's not the same.

Q What are the differences?

MR. STEMLER: Objection. Form.

A Well, the LPG cut valve is on the LPG line. And the gasoline cut valve is on the gasoline line.

Q Are you aware of any other differences?

MR. STEMLER: Objection. Form.

A I mean, they're connected to different contact points on the fuel switching switch.

1 **Q Are you aware of any other differences?**
2 MR. STEMLER: Objection. Form.
3 A I don't see any other differences
4 articulated in the Nakafushi reference.
5 **Q And Nakafushi's Figure 1 is a flowchart**
6 **or a schematic diagram, correct?**
7 A Well, I think it's got elements of
8 both. It's both a schematic diagram and a
9 flowchart. Those are two different things. And
10 it's kind of both.
11 **Q But it's not an engineering drawing**
12 **sufficient to construct an engine, correct?**
13 MR. STEMLER: Objection. Form.
14 A I don't think Figure 1 in Nakafushi is
15 an engineering drawing. But I think to a person
16 of ordinary skill in the art, Nakafushi provides
17 enough information to construct the engine that
18 is described.
19 **Q As a person of ordinary skill in the**
20 **art, would you use the same valve for LPG cut**
21 **valve 18 and gasoline cut valve 17?**
22 MR. STEMLER: Objection. Form.

A You could, but you wouldn't have to.

Q What considerations would go into whether or not you would use the same valve for LPG cut valve 18 and gasoline cut valve 17?

MR. STEMLER: Objection. Form. Relevance.

A It would be the specific application that you're constructing the engine for.

Q Nakafushi also depicts a "vaporizer" 14.

Do you see that?

A Yes. I see No. 14 in Figure 1 of Nakafushi.

Q What is the purpose of vaporizer 14?

MR. STEMLER: Objection. Form.

A The purpose is to vaporize the LPG.

Q When you say "vaporize," do you mean convert liquid LPG into gaseous LPG?

MR. STEMLER: Objection. Form.

A Well, there will be some gaseous LPG, some LPG in the gas phase entering the vaporizer. But, yes, it's vaporizing liquid LPG into LPG in

1 the gas phase.

2 **Q Nakafushi also discloses what is**

3 **labeled "switching means" 22.**

4 **Do you see that?**

5 A Yes.

6 **Q What is your understanding of what**

7 **Nakafushi's switching means 22 is?**

8 A It's a means to switch the operation of

9 the engine from gasoline to LPG or vice versa.

10 **Q And there's a numeral on Figure 1,**

11 **No. 21, that isn't labeled.**

12 **What is your understanding of what 21 is**

13 **referring to?**

14 A 21 is a battery.

15 **Q What is your understanding of why**

16 **Nakafushi includes a battery?**

17 MR. STEMLER: Objection. Form.

18 A To provide power to the switching

19 means.

20 **Q And connected to the battery is what**

21 **appears to be a switch on Figure 1 that's labeled**

22 **"20."**

Do you see that?

A I see 20.

Q What is the purpose of No. 20?

A 20 is the ignition switch.

Q What is an ignition switch?

MR. STEMLER: Objection. Form.

A Are you asking about Nakafushi specifically or generally what an ignition switch is?

Q Generally, what is an ignition switch?

A It's something that is switched to start an ignition process.

Q What is Nakafushi's ignition switch No. 20?

A It's a switch that can be turned on to operate the engine.

Q Figure 1 appears to depict switch 20 in an open position. Is that correct?

A It appears that in Figure 1 of Nakafushi, switch 20 is shown in an open position. Yes.

Q And when switch 20 is in an open

1 **position, is LPG cut valve 18 open or closed?**
2 A Can you repeat the question? Which
3 valve are we asking about?
4 **Q When fuel -- sorry.**
5 **When switch 20 is in an open position, is**
6 **LPG cut valve 18 open or closed?**
7 A So as I sit here reading Nakafushi, it
8 looks like the cut signal is needed to -- for the
9 valve to block the supply of LPG. So I think if
10 the switch 20 is open that the valve 18 will be
11 open. That's my interpretation as I sit here.
12 **Q So if switch 20 is open, LPG will flow**
13 **through LPG cut valve 18?**
14 MR. STEMLER: Objection. Form.
15 A No. I don't think that would happen.
16 **Q Why not?**
17 A Because the engine would be off, and so
18 I don't think there would be a flow of fuel.
19 **Q Well, when Nakafushi's switch 20 is**
20 **open, what is the position of gasoline cut valve**
21 **17?**
22 MR. STEMLER: Objection. Form.

A So I think looking at Nakafushi, if the switch 20 is open, then I think the valve 17 would be open.

Q Nakafushi also depicts a "fuel switching switch" 19, correct?

A Yes.

Q Can you explain to me what impact each of the positions, 19a, 19b, and 19c have for fuel switching switch 19?

MR. STEMLER: Objection. Form.

A Yes, I can.

Q What impact would position 19a have on the Nakafushi system?

MR. STEMLER: Objection. Form.

A So I'm going to review my declaration to see where I describe this because as I'm reading it now, it's maybe a little trickier than I first thought. So I'm going to look at my declaration to refresh my memory.

Yeah. Okay. I have -- I need you to repeat the question here. But it's a little tricky because the language is translated, so it just

took me a little time to make sure I was understanding, but I'm happy to answer your question now.

Q Sure. When fuel switching switch 19 is in position a, what is the impact on control valve 23, gasoline cut valve 17, and LPG cut valve 18?

MR. STEMLER: Objection. Form.

A So I'm looking at Figure 1 of Nakafushi. When you move that switch 19 so that it's connected between the point 19c and 19a, that will close the LPG cut valve and open the gasoline cut valve.

Q What impact does it have on control valve 23?

A It opens control valve 23.

Q What is the impact of positioning fuel switching switch 19 so that it is between positions 19c and 19b?

A So that will close the gasoline cut valve. It will allow control valve 23 to close, and it will allow the LPG cut valve to open.

1 **Q When you say "allow," what does that**
2 **mean?**
3 A So these are solenoid valves which have
4 a normally opened or a normally closed position.
5 So I'm just distinguishing when I use the word
6 "allow."
7 **Q And are valves 17 and 18 normally open**
8 **or normally closed?**
9 A So --
10 MR. STEMLER: Objection. Form.
11 A So in Figure 1 of Nakafushi, the
12 gasoline cut valve 17 and the LPG cut valve 18
13 are both normally open.
14 **Q Is that true for control valve 23 as**
15 **well?**
16 A No. Control valve 23 is normally
17 closed.
18 **Q What is it about Nakafushi that tells**
19 **you that?**
20 MR. STEMLER: Objection. Form.
21 A So it's the Figure 1 in combination
22 with the specification describing how it works.

1 **Q What portion of the specification tells**
2 **you that control valve 23 is normally closed?**
3 A There may be multiple places, but at
4 least on page 6, starting at line 8.
5 **Q Can you read the portion that you're**
6 **referring to, please.**
7 A Okay. Starting -- I guess it's
8 paragraph 14, but that's line 8 on page 6.
9 "Furthermore, a control valve 23 configured
10 to open and close the fuel outflow passage 6 is
11 disposed so as to intervene in the fuel outflow
12 passage 6. The control valve 23 is connected to
13 the gasoline contact point 19a of the fuel
14 switching switch 19 and is configured so that
15 when the fuel switching switch 19 is switched to
16 the gasoline contact point 19a side, that is when
17 the operation of the gasoline supply means 12 is
18 selected, the control valve 23 is turned on upon
19 receiving a cut signal to open the fuel outflow
20 passage 6, thereby allowing the gasoline to be
21 sucked from the float chamber."
22 MR. FINCH: Let's go ahead and take

1 another short break.
2 (A recess was taken.)
3 BY MR. FINCH:
4 **Q Dr. Morse, I'm going to hand you**
5 **another document, previously marked Exhibit 1012.**
6 A copy for Taylor as well.
7 MR. STEMLER: Thank you.
8 (Previously marked Exhibit 1012
9 incorporated by reference.)
10 MR. FINCH: Just put that to the side
11 for now. I actually jumped ahead. I'm going to
12 hand you another, another document previously
13 marked Exhibit 1009.
14 (Previously marked Exhibit 1009
15 incorporated by reference.)
16 BY MR. FINCH:
17 **Q Starting with Exhibit 1009, Dr. Morse,**
18 **do you have an understanding of what this**
19 **document is?**
20 A Yes.
21 **Q What is your understanding of what this**
22 **document is?**

A It's a patent to Holzapfel.

Q The title of it is "Fuel system for internal combustion engines."

Is that correct?

A Yes.

Q Do you understand the purpose of the internal combustion engine disclosed in Holzapfel?

MR. STEMLER: Objection. Form.

A My recollection is that Holzapfel is not specific about the application of the internal combustion engine.

Q If you look at Figure 1 on the first page of this reference, there's a numeral No. 15.

Do you see that?

A Yes.

Q Do you have an understanding of what numeral 15 refers to?

A Yes. 15 is the gasoline tank.

Q We talked earlier about propane tanks, generally, and how they include both liquid and gaseous propane in a tank in most circumstances.

Is that true for gasoline tanks as well? Do they include both liquid and gasoline vapor?

MR. STEMLER: Objection. Form.

A Yes. So a gasoline tank will typically have gasoline vapor in the head space.

Q When you say "head space," what does that mean?

A That means the space in the tank that is not occupied by the liquid.

Q Are you aware of any applications for gasoline vapor?

MR. STEMLER: Objection. Form. Relevance.

A Yes.

Q Can you give me an example of an application for gasoline vapor?

A One application would be an internal combustion engine.

Q Let's look back at Exhibit 1009. Figure 1 shows what appears to be a tube or a pipe or some other structure connected to Figure 15 labeled "12."

Do you see that?

A I see No. 12 in Figure 1.

Q What is your understanding of what No. 12 refers to in Figure 1?

A It's a fuel supply line.

Q What is the purpose of a fuel supply line in an engine such as the one disclosed in Exhibit 1009?

A So the purpose is to bring liquid fuel from the tank 15 to the carburetor.

Q So one end of the fuel supply line is attached to tank 15; is that correct?

A Yes.

Q How is that sort of an attachment usually performed?

MR. STEMLER: Objection. Form. Relevance.

A I mean, are you asking generally about attaching a fuel line to a gasoline tank or are you asking about how it's done in Holzapfel?

Q Generally, how would a fuel line be attached to a gasoline tank?

A Well, it could be done a number of different ways. It's common to have a hose barb on the tank and then an elastomeric fuel line that attaches to the barb, and typically with a clip to secure it. You can also connect it with a hard line, so a line that's made out of metal and use a threaded connection to a corresponding threaded connection on the tank.

Q Turning back to Exhibit 1009, the other end of fuel line 12 that is not connected to the gasoline tank, where is that connected?

MR. STEMLER: Objection. Form.

A It's connected to an inlet connection of the carburetor.

Q Is that depicted in one of the Holzapfel figures?

A It's No. 11 in Figure 2.

Q What is the purpose of the inlet connection No. 11 in Figure 2?

A To connect the fuel supply line to the carburetor.

Q And how is the fuel supply line 12

1 **connected to the inlet connection 11?**
2 A As I'm reviewing, I don't think that
3 Holzapfel is specific on that. I think there is
4 multiple ways it could be connected.
5 **Q Based on the disclosure of Holzapfel,**
6 **do you have any understanding as to how it is**
7 **connected?**
8 MR. STEMLER: Objection. Form.
9 A Is there a specific spot in my
10 declaration where I describe that connection?
11 **Q Not that I'm aware of. No.**
12 A So can you restate from the previous
13 question?
14 **Q Based on the disclosure of Holzapfel,**
15 **do you have any understanding as to how fuel**
16 **line 12 is connected to inlet connection 11?**
17 MR. STEMLER: Objection. Form.
18 Relevance. Scope.
19 A So I think a person of ordinary skill
20 in the art reading Holzapfel would know that
21 multiple connection methods could be used.
22 Figure 2 -- the embodiment in Figure 2 depicts

what appears to be a threaded connection, but other connection types are also possible.

Q Holzapfel contains two numerals, 9 and 10.

What is your understanding of numerals 9 and 10?

A So 9 is a needle valve and 10 is a flow passage.

Q And you said 10 is a flow passage. Where is that -- what is that passage connecting?

A That passage is connecting the inlet connection to the float of the carburetor, the float chamber of the carburetor.

Q What is the purpose of the needle valve 9?

A To open or close the flow passage to the float chamber.

Q Figure 1 of Holzapfel also has what appears to be another tank labeled "16."

Do you see that?

A I see No. 16.

Q What is your understanding of what

numeral 16 refers to?

A That refers to a fuel supply tank that holds a compressed liquified fuel.

Q Does Holzapfel disclose what compressed liquified fuel is in fuel tank 16?

A I don't think it's specific. It refers to a fuel that is normally gaseous and in a liquified condition due to compression.

Q Would that description accurately refer to LPG?

A Yes.

Q And Holzapfel has numeral 17. What is your understanding of that numeral?

MR. STEMLER: Objection. Form.

A 17 is a fuel supply tube.

Q Does 17 draw gaseous fuel or liquid fuel?

MR. STEMLER: Objection. Form.

A So in Holzapfel, there would be both liquid and gas in tube 17.

Q What leads you to that understanding?

A So that's based on the specification of

1 Holzapfel and physics.
2 **Q What particular portion of the**
3 **specification and what physics lead you to that**
4 **understanding?**
5 A So I'm looking at -- so -- well, it's
6 page 2 of Holzapfel, but it says page 3 of 4 at
7 the bottom. So it depends on whether you want to
8 go with the exhibit page nomenclature or
9 Holzapfel's nomenclature.
10 But from Holzapfel's nomenclature, it's
11 page 2. And it's starting at Column -- sorry,
12 line 12, which is the left column.
13 **Q Can you read which line you're**
14 **referring to?**
15 A Sure. So the section of Holzapfel is
16 "From tank 16, there extends a suitable gaseous
17 fuel supply tube 17 extending to the bottom of
18 the tank 16 so as to draw off the liquid and not
19 gas.
20 "The gaseous fuel supply tube is preferably
21 threaded through the exhaust manifold 4 of the
22 engine 2 as is indicated at 18 so that the fuel

1 passing therethrough will be heated by contact of
2 the tube 17 with the hot exhaust gases coming
3 from the engine."
4 There may be other relevant descriptions in
5 Holzapfel, but that description is part of why I
6 say there's liquid and gas in tube 17.
7 **Q When you say "that description is part**
8 **of why," what is the rest of the reasoning for**
9 **your answer?**
10 A Well, as a compressed gas moves through
11 a tube, the pressure will drop. And that will
12 result in further vaporization of that compressed
13 gas.
14 And then the heat transfer with the engine
15 exhaust manifold that's described will also lead
16 to vaporization of the compressed gas.
17 **Q So is it your understanding that liquid**
18 **gas is drawn into the tube and then subsequently**
19 **vaporizes?**
20 MR. STEMLER: Objection. Form.
21 A So, yes, there will be liquid that's
22 drawn into the tube that vaporizes. But there

will also be gas just inside of the tube. So I guess I would say yes, but that means there's going to also be vapor throughout the tube.

Q Where is the other end of tube 17 connected?

MR. STEMLER: Objection. Form.

A Okay. So the tube 17 goes through the exhaust manifold and then is connected to a filter and heat exchanger by way of an additional short section of tubing.

Q What is a heat exchanger in this context?

A It's a device that exchanges heat.

Q What is the purpose of a heat exchanger in this context?

A To take heat from the engine and transfer that heat to the gaseous fuel.

Q Why is it important to take heat from the engine and transfer it to the gaseous fuel?

MR. STEMLER: Objection. Form.

A Well, it may not be important.

Q As a person of ordinary skill in the

art, do you have an understanding as to why Holzapfel included a heat exchanger here?

A Yes.

Q What is that understanding?

A To further assist in heating the gaseous fuel.

Q Why does Holzapfel disclose the need to further assist in heating the gaseous fuel?

MR. STEMLER: Objection. Form.

A So I don't know if Holzapfel specifically describes why. And I don't remember whether I discuss this in my declaration or not, as I sit here.

Q Do you have an understanding as to why Holzapfel includes a heat exchanger?

A Yes.

Q What is that understanding?

A To further assist in heating the gaseous fuel.

Q Do you have an understanding as to why it is important to further assist in heating the gaseous fuel in the Holzapfel system?

MR. STEMLER: Objection. Form.
A It may not be important.
Q So is it your opinion that Holzapfel included a structure that is not important?
MR. STEMLER: Objection. Form.
A I think that it may include -- so Holzapfel may include a structure that is not always important. Yes.
Q Do you have any understanding as to why Holzapfel included a structure that is not important?
MR. STEMLER: Objection. Form.
A Well, I didn't say that. I don't think Holzapfel included a structure that is not important.
Q Why is the heat exchanger disclosed by Holzapfel important?
MR. STEMLER: Objection. Form.
A It may not always be important, but there's certain circumstances under which it may be important.
Q Under which circumstances may it be

1 **important?**

2 A Well, Holzapfel doesn't describe that

3 specifically, as I -- to my recollection, as I

4 sit here. Again, I don't recall whether I talk

5 about this in my declaration.

6 But generally speaking, there's a couple of

7 reasons why heating of a gaseous fuel to an

8 engine may be advantageous.

9 **Q Is it your understanding that the heat**

10 **exchanger here is heating a gaseous fuel?**

11 MR. STEMLER: Objection. Form.

12 A So Holzapfel says "heat exchanger which

13 further assists in heating the gaseous fuel."

14 **Q Do you have an understanding as to at**

15 **what point in the Holzapfel system the fuel drawn**

16 **from tank 16 goes from liquid to gaseous?**

17 MR. STEMLER: Objection. Form.

18 A So the -- I mean, depending on the

19 definition you apply, it may be reasonable to

20 consider the fuel to be a gaseous fuel at all

21 points in Holzapfel because Holzapfel

22 distinguishes using a liquid fuel and a gaseous

1 fuel. So I think it's using the phrase "gaseous
2 fuel" to refer to that second fuel at all times.
3 So if you're just using the phrase "gaseous
4 fuel," you might have a different answer than if
5 you're asking are the molecules in a liquid phase
6 or a gas phase at different points.
7 **Q What is your understanding as to**
8 **reasons why it is important to heat the fuel at**
9 **the heat exchanger disclosed by Holzapfel?**
10 MR. STEMLER: Objection. Form.
11 A I mean, it may not be important at all
12 times. And Holzapfel does not describe it
13 specifically, based on my review today. I don't
14 remember if it's in my declaration, as I sit
15 here. There are certain advantages that occur
16 under certain conditions to providing heat to the
17 gaseous fuel.
18 **Q What advantages occur under which**
19 **conditions to providing heat to the gaseous fuel?**
20 MR. STEMLER: Objection. Form.
21 A So you may increase the efficiency of
22 the engine by preheating the fuel because of how

that impacts the combustion process. You can get higher pressure generated in the engine at the point of combustion if you preheated the fuel. And it may also increase the pressure in the fuel as it's flowing to the engine.

Q Why is it an advantage to increase the pressure in the fuel as it's flowing to the engine?

MR. STEMLER: Objection. Form.

A Well, it may not be an advantage in all cases, depending on how you've configured everything. But in certain circumstances, it may provide a higher mass flow rate of fuel to the engine which may be desirable to increase engine power.

Q Is that true in all circumstances?

MR. STEMLER: Objection. Form.

A There may -- no. In certain circumstances, having higher engine power may not be an advantage, so no.

Q Are there circumstances where it's beneficial to provide a lower mass fuel flow rate

of fuel to the engine?

A Yes.

Q Can you give me an example of a circumstance?

A Okay. Well, if you're controlling the air-fuel ratio in a way that would lead to improper air-fuel mixture if you had too high of a mass flow rate of fuel. Or if you are controlling the air-fuel ratio and the mass flow rate is dictating your engine power, perhaps you don't want as high an engine power.

Those are two examples where a higher mass flow rate of fuel would be undesirable. Probably other examples as well.

Q Is it fair to say that the particular mass flow rate of fuel is dictated by the specific configuration of the engine?

A Yes. And other things besides just the engine, but yes.

Q What other things?

A Well, the configuration -- the fluid properties of the fuel and the configuration of

1 the tank where the fuel is stored and the
2 configuration of the fuel line from the tank to
3 the engine.
4 **Q Go ahead and turn to Exhibit 1012,**
5 **which we discussed previously -- or which I**
6 **handed you previously.**
7 **Do you have an understanding of what this**
8 **document is?**
9 A Yes. This is one of the prior art
10 references that I cite in my report. I think
11 I've called it the workshop manual or sometimes
12 the Kubota reference.
13 **Q What is the workshop manual?**
14 MR. STEMLER: Objection. Form.
15 A So it's a manual that discusses the
16 design, servicing, maintenance of a suite of
17 models of engines that can run on different
18 fuels.
19 **Q When you say "suite of models of**
20 **different engines," what are you referring to?**
21 A So I understand the manual to refer
22 to three different models, and those three models

are similar, but not the same. So I call them a suite of models because of the similarities between them.

Q What are those three models?

A Those are on the cover. So it's the WG972-E2, the DF972-E2, and the DG972-E2.

Q What is your understanding of the main difference between those three models of engine?

A I'm going to see if I cover this in my declaration, to save me the time of looking at the manual.

So the WG972 is a gasoline engine. The DF972 is a dual fuel engine that can run on gasoline or LPG. And the DG972 is a natural gas engine. There are other differences in the engines. But that's the summary based on the fuel they use.

Q Did you focus on a particular model in your declaration?

A Yes.

Q Which model?

A The DF972, the dual fuel model.

Q Do you have an understanding of the purpose of the DF972 engine disclosed by the workshop manual?

MR. STEMLER: Objection. Form.

A So I don't see the manual identifying specific applications. It could be used for a range of applications.

Q What is your understanding of the range of applications this engine could be used for?

MR. STEMLER: Objection. Form.

A Generally speaking, it could be used to generate power, to drive heavy machinery, or provide power to other systems or applications that needed it. There would be a wide range of uses for such an engine.

Q When you say "heavy machinery," what are you referring to?

A So a lot of, like, industrial equipment that requires mechanical power that can be provided by an engine such as the Kubota engine.

Q What is it about the Kubota engine that makes you think it would be applicable for

1 **driving heavy machinery?**

2 A Just because that's an application

3 generally that an engine can be used for.

4 **Q So there's nothing specific about the**

5 **Kubota engine that leads you to that purpose?**

6 A There may be. I don't have anything

7 specific to point to as I sit here today. That

8 may be in my declaration.

9 MR. STEMLER: Objection. Form.

10 **Q Turn to page 8 of the Kubota reference.**

11 **It's labeled "I-4" at the bottom.**

12 **What is your understanding of what is shown**

13 **on page 8 of the Kubota reference?**

14 A It's a spec sheet.

15 **Q On the left column, it says "Number of**

16 **Cylinders."**

17 **Do you see that?**

18 A Yes.

19 **Q What does that refer to?**

20 A The number of cylinders.

21 **Q What is a cylinder in the context of**

22 **the Kubota workshop manual?**

A Well, a cylinder is part of an engine where combustion occurs. So it's the part of it that converts the energy from combustion into mechanical energy. The cylinders turn the shaft.

Q And the specification sheet lists that there are three cylinders in the dual fuel engine; is that correct?

A Yes.

Q Do you have an understanding as to why the dual fuel engine uses three cylinders?

A I have a general understanding of the engine design process associated with selecting the number of cylinders. I don't know specifically how Kubota decided on three cylinders for this particular engine.

Q The left column also has a label for "Type."

Do you see that?

A Yes.

Q And it indicates that the dual fuel engine is a vertical water-cooled, four-cylinder, dual fuel -- or four-cycle, dual fuel engine.

Do you see that?

A Yes.

Q What does it mean to be a vertical engine?

A So I was looking for a photo that might help. It just refers to the orientation of the cylinders.

Q Are there other types of orientations of cylinders other than vertical that are common in engine design?

A Yeah.

Q What are those other types?

A I mean, you could also have horizontal and then there are other, like, more complicated configurations.

Q What impact does the configuration of the cylinders have on an engine?

MR. STEMLER: Objection. Form.

A Well, it has to do with balancing the geometrical footprint of the engine with engine performance over different operating conditions.

Q It also states -- excuse me.

The Kubota workshop manual also states the type of engine is a water-cooled, four-cycle engine. What does it mean to be a water-cooled, four-cycle engine?

A Well, those are two separate things. So do you want to know about water-cooled first or about four-cycle first?

Q Let's start with water-cooled.

A So that means that it's using water -- although I have to remind myself it may be water with antifreeze -- as the heat transfer fluid for cooling the engine block.

Q What is a four-cycle engine?

A So that refers to the combustion cycle that the cylinders use. So four-cycle means that there's a compression cycle that's separate from the cycle that expels the products of combustion, which makes it different from a two-cycle engine.

Q Are there differences in the applications that two-cycle and four-cycle engines are suitable for?

A Generally. There's some overlap where

you might want to use one versus the other.

Q And that would depend on the design characteristics of a particular use case?

A Yeah. Whether you would want to use a four-cycle or a two-cycle or whether you could use either, and the trade-offs that might exist from using a four-cycle or two-cycle depend upon the specific use of the engine.

Q On the left column, it says "Total Displacement," which I think we discussed earlier is a -- one measure of the size of an engine; is that correct?

MR. STEMLER: Objection. Form.

A Yes. Total displacement is a measure of a size of an engine.

Q Workshop manual states that the displacement is 962 cubic centimeters; is that correct?

A Yes.

Q Is that a relatively large or relatively small engine, in your experience?

MR. STEMLER: Objection. Form.

A I think it depends on the context.

Q When you say "it depends on the context," what does that mean?

A Well, in some applications, that would be considered to be a small engine. In other applications, that would be considered to be a large engine.

Q What are some examples of applications where that would be considered to be a large engine?

A Okay. So I think if you used an engine with a total displacement of 962 cubic centimeters on a vehicle, that would be a small engine. If you use it on a lawn mower, that would be a large engine.

Q Okay.

Also on this left column, there are labels for "Ignition System" and "Starting System."

What is the difference between an ignition system and a starting system?

A Well, the ignition system has to do with how you're actually igniting the fuel in the

cylinders. And the starting system refers to how you're getting the engine going from a stopped configuration.

Q It says the starting system here is an electric starting with starter. Is that correct?

A Yes.

Q How does that type of system work, in your experience?

MR. STEMLER: Objection. Form.

A That uses electric power to get the engine turning initially until the combustion process can power the engine.

Q Also it lists a battery, the 12-volt battery.

Do you see that?

A Yeah. I see battery, 12-volt, 52-amp hours or equivalent.

Q Do you know what the purpose of the battery is in the system disclosed by the workshop manual?

MR. STEMLER: Objection. Form.

A Yes. Generally.

Q What is the purpose of the battery?

MR. STEMLER: Objection. Form.

A So the purpose of the battery in the Kubota engine is to provide power to the engine until the engine is able to generate its own power from the combustion of the engine, the rotation of the engine and the alternator.

Q Will you turn to page 65, please, of the workshop manual. This is labeled "Fuel System" at the top.

Do you see that?

A Yes.

Q And there's a -- first, there are two diagrams on this page, correct?

A Yes.

Q What is the difference between the A diagram and the B diagram?

MR. STEMLER: Objection. Form.

A So on page 65 of Exhibit 1012, the diagram on the left labeled "A" is for the model WG972. And the diagram on the right labeled "B" is for model DF972.

Q And those are the gasoline and dual fuel engines, correct?

MR. STEMLER: Objection. Form.

A WG is the gasoline engine and DF is the dual fuel engine.

Q So referring to Figure B on this page, numeral 6 is referred to as a "gasoline tank."

Do you see that?

A Yes.

Q And downstream from that tank is a structure referred to as a "gasoline cock."

Do you see that?

A Yes.

Q What is the purpose of a gasoline cock?

MR. STEMLER: Objection. Form.

A That is a valve that can be opened or closed to allow or block flow of gasoline.

Q And do you understand why a designer or operator of this engine would want to open or close a valve at that point in the system to block the flow of gasoline?

MR. STEMLER: Objection. Form.

A So that's just something that could be used to shut off the flow of gasoline, if and when needed.

Q Do you have any understanding as to why a designer or operator might need to shut off the flow of gasoline at that point in the system?

MR. STEMLER: Objection. Form.

A If they didn't want to run the engine on gasoline or if they didn't want gasoline to be able to flow through that line.

Q The next structure downstream from there is labeled "No. 4," "Fuel Filter."

Do you see that?

A Sorry. Can you remind me which page, just to save me some time?

Q Page 65.

A Thank you. Yes. So No. 4 is a fuel filter.

Q And is that the same as the fuel filter we discussed with respect to Nakafushi earlier?

A It would be similar. I don't know if it would be exactly the same.

1 **Q What would impact whether or not it was**
2 **exactly the same?**
3 A Well, Nakafushi is broader and doesn't
4 provide full details on the filter.
5 If we looked through Kubota, there would be
6 information talking about the filter. So it's
7 more specific in Kubota would be a way to put it.
8 **Q Would you use Kubota's fuel filter 4 in**
9 **the Nakafushi system?**
10 MR. STEMLER: Objection. Form.
11 A I mean, generally, yes. But if you're
12 trying to use Nakafushi, you're going to be
13 choosing a filter based on your specific
14 application.
15 So I think there would be applications where
16 you would use the same filter in Kubota with
17 Nakafushi, yes, but maybe not all applications.
18 **Q And you said that would depend on the**
19 **specific application of the engine?**
20 A It would depend upon the specifics of
21 the fuel you're using and the engine.
22 **Q Numeral 3 on page 65 is labeled "Fuel**

Feed Pump."

Do you see that?

A Yes.

Q What is the purpose of a fuel feed pump?

MR. STEMLER: Objection. Form.

A That's to move gasoline from the tank to the carburetor.

Q And would you use the same fuel feed pump disclosed in the workshop manual for the Nakafushi system?

MR. STEMLER: Objection. Form.

A I think you could. The Kubota reference is more specific than the Nakafushi reference with respect to the fuel pump.

Q When you say "you could," what circumstances would determine whether or not you would?

MR. STEMLER: Objection. Form.

A So if you were building an engine in accordance with the Nakafushi reference, and you chose to have a similar engine displacement and

gasoline type and dimensions of fuel lines as in the workshop manual, then you might choose to use the same fuel pump as in the workshop manual.

Q But if those configurations were different, you might go with a different fuel pump?

MR. STEMLER: Objection. Form.

A Well, you'd still have a fuel pump, but you would, like, sizing your fuel pump, for example, based on how much gasoline you need to get to the engine.

Q The figure on page 65 has a numeral labeled "A," "Gasoline Line."

Do you see that?

A Yes.

Q Okay. It's a little unclear from this figure where that line terminates at. Do you know if the workshop manual discloses the endpoint of that line?

MR. STEMLER: Objection. Form.

A Endpoint in which direction?

Q The nongasoline tank endpoint

1 **downstream.**

2 A That gasoline line goes to the

3 carburetor. Kubota has additional images that we

4 could look at to further understand the geometry.

5 **Q And those additional images you're**

6 **referring to, are those on page 68?**

7 A That's one example. There may be

8 others.

9 **Q In the images on page 68, can you**

10 **describe where the fuel line A we discussed**

11 **attaches to the carburetor?**

12 MR. STEMLER: Objection. Form.

13 A So I don't think the connection is

14 shown very well on page 68. You can kind of see

15 a little bit of it in the bottom image on

16 page 68. But the view that's shown doesn't

17 depict it as well.

18 **Q Do you know if there's another image**

19 **that depicts where fuel line A attaches to the**

20 **carburetor?**

21 A I'd have to review. I think that there

22 is. I'd have to review my declaration and the

manual to identify that, but I expect there is.

Q Can you do that, please.

A So I'm looking at page 53 of my declaration. And there's a figure at the bottom of page 53. It's after paragraph 93. And it shows the carburetor pulled away from the engine and there is -- it looks like it's a brass component. It terminates in a barb that's at the -- the person's holding the carburetor at their index finger. And that is the spot where gasoline goes into the carburetor.

Q Turning back to the diagram on page 68, can you please describe the route that gasoline takes through the carburetor?

MR. STEMLER: Objection. Form.

A You don't really see all the relevant components in the figures on page 68. But liquid gasoline comes into the carburetor from the side and then it enters the float chamber. And when the engine is running, so you have airflow, then that will draw gasoline up from the bottom of the float chamber up through a flow passageway that

1 runs vertically up the middle of the carburetor
2 and then into the airflow path.
3 **Q The airflow path, is that the circle in**
4 **the middle of the center figure on page 68?**
5 A So it's a little more complicated than
6 just that. But, yeah, I think we're talking
7 about the same thing. There's a couple of
8 circular things.
9 But there's a circle in the -- generally in
10 the middle of the middle figure on page 68 which
11 is a cross-sectional view of a portion of the
12 airflow path.
13 **Q That same figure on page 68 has**
14 **structures labeled "5" and "6."**
15 **Do you see those?**
16 A Yes.
17 **Q What is your understanding of the**
18 **structures labeled "5" and "6"?**
19 MR. STEMLER: Objection. Form.
20 A So 6 is a solenoid valve. It's called
21 a "gasoline cutoff solenoid." And 5 is like the
22 valve element end of the solenoid valve. That's

the location where a valve element seats or unseats to allow flow of gasoline or block the flow of gasoline.

Q And is that solenoid controlled by the wiring diagram in the third figure on that page?

MR. STEMLER: Objection. Form.

A So the diagram at the bottom of page 68 shows the electrical configuration for controlling certain valves in the DF972, including the solenoid valve that's identified with the number 6.

Q And there are two switches identified in that diagram, correct?

MR. STEMLER: Objection. Form.

A Yes. There are two switches identified in the bottom figure on page 68.

Q The first one is main switch 7; is that correct?

A That's one of them. Yes.

Q What is your understanding of the purpose of main switch 7?

MR. STEMLER: Objection. Form.

A That's to control whether or not there's electrical current flowing to the fuel select switch 8; so, therefore, to the solenoid valves.

Q And when main switch 7 is off, so there's no power flowing through it, what position would the solenoid valves be in?

MR. STEMLER: Objection. Form.

A Are you asking me about valve 6?

Q Sure. Let's start with valve 6.

A Valve 6, as depicted on page 68 of the workshop manual, is normally closed. So if there's no power, then the valve will be closed.

Q Is that true for valve 3 as well?

A Yes.

Q And then if main switch 7 is turned on, that allows power to go to fuel select switch 8, correct?

MR. STEMLER: Objection. Form.

A Yes.

Q And fuel select switch 8 determines whether power goes to LPG cutoff solenoid 3 or

gasoline cutoff solenoid 6; is that correct?

MR. STEMLER: Objection. Form.

A Yes.

Q Of those two solenoids, whichever one receives power would be opened; is that correct?

MR. STEMLER: Objection. Form.

A Yeah, so looking at page 68 of the workshop manual, both valve 3 and 6 are normally closed. So the valve that receives power will open and the other valve will remain closed.

Q And there's a third solenoid listed here as well, LPG shutoff solenoid valve No. 9. Do you see that?

A Yes.

Q And that should have the same powered operational characteristics as LPG cutoff solenoid 3; is that correct?

A So both solenoid valves 3 and 9 are wired to the same terminal. So if one is receiving power, the other will be receiving power.

Q Do you have an understanding as to

whether or not LPG shutoff solenoid valve No. 9 is normally closed or normally open?

A It's normally closed.

Q Looking at the second figure on this page, it shows gasoline cutoff solenoid 6 attached to the carburetor.

Is that your understanding?

MR. STEMLER: Objection. Form.

A I think this is something that I discuss in my declaration, so I'm just going to flip to refresh my memory.

Yeah. So the gasoline cutoff solenoid 6 is incorporated into the carburetor.

Q What does that mean?

MR. STEMLER: Objection. Form.

A That it's part of the carburetor.

Q When you say "part of the carburetor," do you mean that it's all one structure or that it's a separate structure that's attached to the carburetor?

MR. STEMLER: Objection. Form.

A So it's incorporated into the

1 carburetor. So it's, like, physically the
2 solenoid is something that could be removed, but
3 how the shop manual engine depiction works, that
4 solenoid is incorporated into the carburetor.
5 That valve that opens or closes is incorporated
6 into the carburetor. It's part of the
7 carburetor.
8 **Q So when you look at this figure on**
9 **page 68, do you see that as all one structure or**
10 **as two separate structures that are attached**
11 **together?**
12 MR. STEMLER: Objection. Form.
13 A So page 68, we're talking about the
14 middle figure?
15 **Q Yes.**
16 A That is the carburetor. That's
17 comprised of different components that can be
18 disassembled.
19 **Q Does the workshop manual disclose how**
20 **those figures are attached to one another?**
21 MR. STEMLER: Objection. Form.
22 A I think there are photographs in the

shop manual that show some of that. Yes.

Q Which photographs are you referring to?

A So it's kind of hard to make out on this reproduction I'm looking at. Page 115 of Exhibit 1012.

Q Which figure are you referring to?

A So I think there's relevant information on how the carburetor is assembled both in the middle figure and the bottom figure.

Q And what relevant information do you note from these figures?

A So you can see that there's components that are -- there's a component that's silver in color. And then there's components that are brass color. So I know those are components that can be separated from each other.

And, again, this reproduction is tough to see, but you can see looking at it that there's thread connections between some of the components. So you can see some of the things that are threaded into each other to assemble the carburetor.

1 **Q Is the gaseous cutoff solenoid depicted**
2 **in either of these figures?**
3 A I see part of the gasoline cutoff
4 solenoid in the middle image on page 115.
5 **Q Where do you see part of the gasoline**
6 **cutoff solanoid?**
7 A So there's a label that says 7, which
8 is carburetor. But to the right of that 7,
9 there's a component that is brass in color, and
10 that is a portion of the gasoline cutoff
11 solenoid.
12 **Q When you say "a portion of the gasoline**
13 **cutoff solenoid," what do you mean?**
14 A Well, you can't see all of it, so
15 you're only seeing a portion of it in that image.
16 **Q What parts of it can't you see in that**
17 **image?**
18 A Okay. If you go to page 68, then you
19 can see that that solenoid extends into the
20 liquid fuel flow path. So some portions of the
21 solenoid valve are visible in that previous
22 figure and some of it are -- since they're inside

the fuel flow path, inside the bottom of the float bowl, you can't see it in that photograph on 115. There may be additional images in Kubota that show this.

Q If you disassembled the gasoline cutoff solenoid, which portions of the solenoid, with respect to the figures on page 68, could be removed?

MR. STEMLER: Objection. Form.

A I guess I don't really understand your question. The carburetor, which is shown on page 68, comprises different components, you know, some of which are threaded together and some of which are manufactured as a unitary piece.

So, you know, are you asking which parts are a unitary piece and which parts are not?

Q Yeah. So let's start there. Which parts of the carburetor do you understand to be a unitary piece?

A Right. So it's actually comprised of, like, multiple different unitary pieces. So

1 you'd have to indicate to me, like, which part of
2 the carburetor you want to start from. And I
3 could do my best to say which parts I think are
4 unitary to that and which parts are able to be
5 assembled, disassembled when you're assembling
6 the carburetor.
7 **Q So there's a structural frame to the**
8 **carburetor, correct?**
9 MR. STEMLER: Objection to the form.
10 A I don't think I'd call it a frame.
11 There's a body to the carburetor.
12 **Q In addition to the body, what other**
13 **structures would you consider to be part of the**
14 **carburetor?**
15 A I mean, I think essentially everything
16 that we're looking at in Figure 68 [sic] is part
17 of the carburetor. I mean, that's what we're
18 looking at is the carburetor, right?
19 I mean, if we look at the upper image on
20 page 68, you know, that's showing the carburetor.
21 So I think, you know, both of those images, top
22 and middle, are showing the carburetor.

1 **Q Does the top image show the gasoline**
2 **cutoff solenoid?**
3 A You can see a part of it, but it's a
4 rotated perspective. So you don't see it because
5 it's blocked by the rest of the carburetor.
6 **Q Let's turn back to page 65. There's an**
7 **LPG tank 14 depicted on page 65.**
8 **Do you see that?**
9 A Yes.
10 **Q And then there's an LPG filter**
11 **downstream from the LPG tank 14.**
12 **Do you see that?**
13 A Yes.
14 **Q Do you have any understanding of the**
15 **structure of the LPG filter No. 12?**
16 A I don't recall as I sit here, but I
17 think there's some information regarding that
18 structure in the other spots in this document.
19 **Q Where would you look in this document**
20 **if you wanted to understand that structure?**
21 A Well, I'd have to look through the
22 manual, although as I look and follow the star

that's after the word "LPG filter" in the caption to the figure, it says, "Component marked star is not provided by Kubota."

So maybe there's not so much information about that filter elsewhere in the document. I'd have to look to refresh my memory.

Q Does that asterisk make you think that you would use a third-party LPG filter?

A I think that's a way to put it. Yes.

Q Does the structure of the fuel system here direct you as a person of ordinary skill in the art to use a specific type of LPG filter in that instance?

MR. STEMLER: Objection. Form.

A There is some information here. I think the filter selection would have to do with the fuel that's being used and flow rates that you might expect through the filter, which is based on aspects of the engine, which is covered in the manual.

Q So how would the flow that is being used impact the -- strike that.

How does the fuel that's being used impact the filter selection?

A So if you had knowledge about the quality of the propane that you were using, that would motivate you to use different types of filters, or that could motivate you to use different types of filters.

MR. STEMLER: Counsel, whenever it's convenient, can we take another break for lunch at some point here?

MR. FINCH: Maybe five or ten more minutes, if that's okay.

MR. STEMLER: Okay.

BY MR. FINCH:

Q So I think we talked about this with respect to Nakafushi, but it sounds like there are different use and design characteristics that would impact which filter was used; is that correct?

MR. STEMLER: Objection. Form.

A That's generally correct.

Q There's a structure here labeled "10,"

1 **"vaporizer."**

2 **Do you see that?**

3 A Yes.

4 **Q What is the purpose of 10, vaporizer?**

5 MR. STEMLER: Objection. Form.

6 A That is to -- well, there's going to be

7 liquid and vapor propane entering the vaporizer,

8 and the purpose of the vaporizer is to supply

9 propane in the vapor phase at a specific pressure

10 downstream to the carburetor.

11 **Q And there's a fuel line gaseous propane**

12 **line B attached to the vaporizer.**

13 **Do you see that?**

14 A Yes.

15 **Q Can you turn to page 68, back to the**

16 **carburetor diagram we've been discussing.**

17 **Where does that line attach to the**

18 **carburetor?**

19 MR. STEMLER: Objection to form.

20 A So I have a labeled figure in my

21 declaration that may be helpful, but it's at the

22 top of the carburetor.

Q There's a structure that sort of looks like a hose barb on the top right.

Is that where it attaches?

A So if you see where there's a number 4 pointed in the middle figure on page 68, and then just to the right of that, there's a horizontal flow passage, and then there's what would be a nut. That's the connection location.

Q And the structure underneath the nut, what is that?

MR. STEMLER: Objection. Form.

A I mean, that's the extension of a fitting that comprises the -- a portion of the carburetor.

Q And that extension of the fitting, is that where the LPG line B attaches?

A So if you look at page 115 of the shop manual, or I guess of the exhibit, it's page 1-S33, in that middle image, there's a hose, black hose coming up vertically sort of towards the left, and then there's like a brass elbow, and that elbow threads into a silver component.

1 And then it goes further in. But that's the gas
2 line. The gaseous fuel line.
3 **Q That black hose?**
4 A Well, not just the black hose, but all
5 that bit that then goes into the carburetor.
6 **Q So it's -- turn to page 5 of the**
7 **exhibit. There's a heading that says "Start**
8 **Safely."**
9 **Do you see that?**
10 A Yes.
11 **Q It says, "Do not do the procedures**
12 **below when you start the engine." And one of**
13 **them is "bypass the safety start switch"?**
14 A I see that.
15 **Q What is the safety start switch?**
16 MR. STEMLER: Objection. Form.
17 A I don't remember the details as I sit
18 here today. I don't think it's in my
19 declaration, so I'd have to review this document
20 to refresh my memory.
21 MR. FINCH: Let's go ahead and take a
22 break for lunch.

1 MR. STEMLER: Okay.

2 (Lunch recess was taken.)

3 BY MR. FINCH:

4 **Q Welcome back, Dr. Morse.**

5 **Can you open your declaration to page 9 for**

6 **me. You have a section listed here called**

7 **"Qualifications and Experience."**

8 **Is that correct?**

9 A Yes.

10 **Q Okay. This section includes your**

11 **relevant background and experience related to the**

12 **subject matter of the '398 patent?**

13 A Yes. Generally speaking.

14 **Q And in paragraph 9, you -- which is on**

15 **page 10, you talk about your educational**

16 **background.**

17 **Do you see that?**

18 A Yes.

19 **Q Okay. You have a bachelor's of**

20 **engineering and mechanical engineering from**

21 **Cooper Union in 2003? Is that correct?**

22 A Yes.

Q Did you do any thesis work as part of that degree?

A I wouldn't -- I had project work. As part of my bachelor's degree, I didn't do anything that I would consider to be thesis work. I did some additional research while I was an undergraduate at Columbia University which may be closer to thesis work.

Q Did you do a senior design project or anything of that nature?

A Yes, I did a senior project.

Q And what was the subject matter of that?

A My senior project at Cooper Union involved developing computer-aided design tools.

Q So like CAD tools?

A Yes. CAD is an acronym that stands for computer-aided design.

Q Then did you do anything in between your Bachelor of Engineering degree and when you started your master's and doctoral program?

MR. STEMLER: Objection. Form.

A I mean, yeah. I did some things. Yeah.

Q What did you do during that intervening time period?

A I did not pursue an academic program, and I was not employed in that three-month time period in between.

Q You did a master's and doctoral program at Cornell; is that correct?

A Yes.

Q Was that a joint program or were those two separate degrees?

A I mean, they're separate degrees, but it was all part of the same program. So I received a master's of science on the way to receiving my Ph.D.

Q I tested out at the master's level and gave up on the Ph.D., and do not regret that in the slightest. So I have lots of credit to you for that.

Did you do any thesis work as part of that degree?

A Yes.

Q What was your thesis?

A So my Ph.D. research was on the topic of flow structure interaction.

Q When you say "flow structure interaction," what does that mean?

A So that means the interaction of fluid mechanics in the motion of a structure. So looking at how flow pass of structure imparts forces or motion on that structure, and then how the motion of a structure in a flow impacts the fluid mechanics, and exploring that coupled phenomenon.

Q And after you graduated from Cornell, were you employed at that time?

A Yes.

Q Where were you employed?

A At a company called Exponent.

Q That was immediately following your graduation from Cornell?

A I can add a little clarity. So I started as a full-time employee of Exponent in

1 the fall of 2008. I had completed all my
2 doctoral work by that point in time, but my
3 degree was not conferred until early 2009.
4 **Q Okay. What is -- in 2008, 2009, what**
5 **was your role at Exponent?**
6 A So I was -- my title at that time was
7 associate, but I was providing consulting in the
8 field of mechanical engineering.
9 **Q What type of consulting?**
10 A So that included different kinds of
11 things. So I worked on failure analysis projects
12 where I was investigating the cause of certain
13 failures, whether that's a fire or an explosion
14 or some other type of failure.
15 I did work reviewing codes and standards and
16 how they applied to designs of systems that
17 involved principles of mechanical engineering.
18 Other projects involving providing
19 consulting in the field of mechanical
20 engineering.
21 **Q Did any of those projects involve**
22 **litigation support at that time?**

1 MR. STEMLER: Objection. Form.
2 A Yes. So in the 2008, 2009 time frame,
3 some of the projects I worked on at Exponent, I
4 think, could be considered in the context of
5 litigation.
6 **Q How long after that did you first**
7 **submit a declaration as an expert?**
8 MR. STEMLER: Objection. Form.
9 A I don't remember specifically when I
10 first issued a declaration as an expert. But my
11 recollection is that it was something like two or
12 three years after I started work at Exponent.
13 **Q So what was the nature of your**
14 **litigation support work before you issued a**
15 **declaration as an expert?**
16 A So it was investigating the cause of
17 specific failures or performing experimental
18 testing or performing quantitative analysis.
19 I've done computational fluid dynamics work.
20 Different engineering tasks associated with
21 answering technical questions in the context of a
22 litigation matter.

1 **Q Did you assist other experts with**
2 **report preparation at that time?**
3 A Yes.
4 **Q Okay. Is that essentially the role**
5 **that Dr. Young has now with respect to this**
6 **litigation?**
7 MR. STEMLER: Objection. Form.
8 Relevance.
9 A I think there's some similarities
10 between what I was doing in my career in the
11 2008, 2009 time frame and what Dr. Young is doing
12 now. But I think it's more than assisting with
13 reports. I think there's a greater volume of
14 work that I was doing then and that she's doing
15 now.
16 **Q Exhibit 1003 is your report in this**
17 **matter, correct?**
18 A Yes.
19 **Q Did you draft this report yourself?**
20 A Yes.
21 **Q Did you write every word of it?**
22 MR. STEMLER: Objection. Form.

1 Relevance.
2 A So I reviewed every word in the report.
3 I think I was likely the one typing the majority
4 of words into the report. But I also reviewed
5 words that were put in the report by others.
6 Q Which others put words into this
7 report?
8 A So Dr. August Young assisted me in
9 authoring this report. And she was working under
10 my direction, and I -- my recollection is that
11 she made edits to the report in certain sections
12 that I reviewed.
13 Q What sections did Dr. Young make edits
14 to?
15 A I know that she reviewed the entirety
16 of the report. I don't recall specifically which
17 sections she was more or less involved with.
18 Q Other than Dr. Young, did anyone else
19 draft portions of this report?
20 MR. STEMLER: Objection. Form.
21 A No. I would say the report was drafted
22 by me.

Q Other than Dr. Young, did anyone else contribute edits to any portion of this report?

MR. STEMLER: Objection. Form.

A Yes. To my recollection, there was others who assisted me in drafting my report.

Q Who are those others?

A So to my recollection, it was two attorneys at the Foley law firm.

Q Did you and Dr. Young discuss the positions taken in this report?

A We discussed the prior art and my analysis of the prior art.

Q Was there any analysis of the prior art that you and Dr. Young disagreed on?

A I don't recall any such disagreements as I sit here today.

Q Turn back to paragraph 10 of the report. You mention developing safety standards for NFPA 52, vehicular natural gas fuel systems code; is that correct?

A Yes.

Q Can you explain at high level what that

is?

A So the National Fire Protection Association is a U.S.-based organization that develops safety codes and standards for a wide range of things. Some of their codes and standards are adopted into law in certain jurisdictions in the United States. And other standards, even if they're not adopted as a matter of law, are regularly used and relied upon in various industries.

So NFPA 52 is a code that applies to vehicles that are powered by natural gas. And one of my roles on the committee for that standard is to review the standard, make edits to the standard, improve it, and take into account input from the community or lessons learned from incidents and develop that code for the safe use of natural gas as a fuel for vehicles.

Q When you say "vehicles," do you mean -- is that automotive vehicles or does that include other types of vehicles as well?

A So the scope would be primarily for

1 automotive vehicles. But there's other parts of
2 the code that would be applicable to other types
3 of vehicles.
4 **Q What other types of vehicles?**
5 A So, like, things like utility vehicles
6 that may not go on the road but may still be
7 used. Those kinds of things.
8 **Q Would something like a riding lawn**
9 **mower fall under this regulation?**
10 MR. STEMLER: Objection. Form.
11 A I -- it's possible. I'd have to review
12 the code to remind myself. But I don't think
13 that a riding lawn mower is covered by NFPA 52.
14 **Q Do you know why there's a separate --**
15 **is there a separate regulation that would cover a**
16 **natural gas lawn mower?**
17 MR. STEMLER: Objection. Form.
18 Relevance.
19 A I expect there are codes and standards
20 that apply to lawn mowers. I don't know if
21 there's -- the full extent of NFPA standards that
22 cover lawn mowers.

1 **Q Do you have any idea as to why the**
2 **standards are broken out to include vehicles, but**
3 **exclude other devices such as lawn mowers?**
4 MR. STEMLER: Objection. Form.
5 Relevance.
6 A Well, I'm not sure that NFPA 52 does
7 not include lawn mowers. And even if it doesn't
8 explicitly, a lot of the wisdom that exists in
9 that standard could be applicable to lawn mowers.
10 But there's always a judgment call and a
11 decision made about the scope of certain
12 standards. And there's many NFPA standards that
13 have scope that could overlap.
14 And parsing through what the scope of a
15 standard should be and understanding how the
16 scope of a particular standard might interact
17 with the scope of another standard is one of the
18 key responsibilities in developing standards.
19 So lines have to be drawn somewhere where
20 certain things are in the scope of one standard
21 or not another, and sometimes that can be a
22 little bit arbitrary or a little bit fuzzy. So

there's no specific reason other than for, you know, convenience of organization of standards.

Q Do you know if the NFPA has a parallel standard to NFPA 52 that would cover LPG vehicles?

MR. STEMLER: Objection. Form. Relevance.

A Well, I know that -- I don't think there's an analogous standard. I know that NFPA 58 has some parts of it that cover vehicles that rely on propane, and there may be other standards as well.

Q What is NFPA 58?

A So that is the liquified petroleum gas code. It's the code that governs the safe use of propane in the United States.

Q In paragraph 11 of your declaration, you mention that you performed research and analysis for the Portable Generator Manufacturers' Association.

Do you see that?

A Yes.

1 **Q What is the PGMA?**
2 A That's an association of manufacturers
3 of portable generators.
4 **Q Is that a U.S.-based association?**
5 A I guess I've only interacted with
6 U.S.-based members of that organization. I don't
7 know as I sit here whether they have any
8 international presence.
9 **Q What is the scope of your research and**
10 **analysis for that organization?**
11 A So I've done a few different things
12 with PGMA. So that work has mainly been in the
13 context of exploring the risk of carbon monoxide.
14 So I've done studies where I've analyzed the
15 generation of carbon monoxide if a generator is
16 improperly used and then the spread of carbon
17 monoxide.
18 I've evaluated how the design of the engine
19 can increase or decrease the amount of carbon
20 monoxide that's generated.
21 And I have evaluated trade-offs in safety
22 associated with having engines that have been --

have different characteristics such that they generate less carbon monoxide, but generate higher exhaust temperatures and trying to understand the relative risk of high temperatures versus carbon monoxide.

Q Did any of that research relate to dual fuel generators or LPG generators?

A So I don't think any of that work was specific to dual fuel generators. But certainly it's relevant to dual fuel generators.

Q Paragraph 12, you state, "Broadly speaking, publications relate to the design and safety of fluid and thermal systems like how the valve closure time affects pressure in a fluid system."

Is this generally referring to publications that you've done in the past?

A Yes.

Q When you say "fluid system" there, is that referring to just liquid fuel, or is it referring to both gas and liquid fuel as a fluid?

MR. STEMLER: Objection. Form.

A So my work on fluid systems is not specific to fuel systems, and would cover systems that use both a liquid or a gas as a fluid.

Q Go ahead and turn to page 212 of your declaration.

Is this a copy of your CV?

A Yes.

Q Is this a standard CV or was this prepared for this matter?

MR. STEMLER: Objection. Form.

A As this is the only CV I have, it was not prepared specifically for this matter.

Q The first paragraph mentions having experience in heat exchangers and heat transfer systems. Can you explain to me what the difference between a heat exchanger and a heat transfer system is?

A So those terms could overlap a bit in terms of how they're used. A heat exchanger typically refers to a specific thing, where heat is transferred from one working fluid to another in a specific device; whereas, a heat transfer

1 system may be broader and could involve systems
2 where the working fluids are, you know, traveling
3 over longer distances. And different components
4 of the system may be far apart from each other.
5 **Q The paragraph also mentions experience**
6 **with valves; is that correct?**
7 A Yes.
8 **Q Is your experience with valves in**
9 **liquid fluid systems, gaseous fueling systems or**
10 **a combination of both?**
11 A So I've experience with valves that are
12 used in gaseous systems, liquid systems, and
13 two-phase systems.
14 **Q Are there any differences between a**
15 **valve used in a gaseous system and a liquid**
16 **system?**
17 MR. STEMLER: Objection. Form.
18 Relevance.
19 A I mean, there's lots of different types
20 of valves, so it depends upon the specific liquid
21 system and the gas system.
22 You could identify two valves that were both

for liquid systems that are more different from each other than a valve that is for a liquid system and a valve that is for a gas system.

Q Are there any valves that are suitable only for a liquid system or only for a gaseous system?

MR. STEMLER: Objection. Form.

A I guess I would say almost all varieties of valves could be used on both, but there are probably some specific types that would only be suitable for a liquid or for a gas.

Q Can you think of an example of a type that would be only suitable for a liquid or only suitable for a gas?

A Yes. So what is coming to mind is a valve where the effect of gravity is either necessary for its operation or could throw off its operation. Because gases don't feel the effects of gravity as much as liquids, so if you have a system that is relying on gravity, it's a liquid system, then it might not work if your working fluid was a gas, and you might have the

1 opposite problem.
2 If you have a system that is expecting not
3 to be affected by gravity, and then you use it
4 with a liquid, then maybe you have an issue.
5 So that's broadly what I'm thinking about.
6 There's also -- from a leak prevention
7 standpoint, it's easier to make something that's
8 leakproof to a liquid than leakproof to a gas.
9 So that might also be a reason why you would have
10 a valve that may work for a liquid but not be
11 leakproof for a gas. Those are sort of general
12 categories of things that might influence why a
13 valve is appropriate for only one and not the
14 other.
15 **Q You also mentioned experience with**
16 **piping systems in your CV. Is that correct?**
17 A Yes.
18 **Q Is that piping systems for liquids or**
19 **gaseous fluids?**
20 A Liquids and gases and two-phase flows.
21 **Q When you say "two-phase flows," what**
22 **does that mean?**

A So that would mean flow that is both a liquid and a gas. And sometimes it changes from liquid to gas over the course of the flow.

Q And are there examples, in your experience, of piping systems that are suitable for liquid flow or gaseous flow, but not both?

MR. STEMLER: Objection. Form.

A I mean, certainly the working fluid is something that is taken into account when designing a piping system. So the fact that gas may have different physical properties from a liquid may motivate differences in the piping system.

But I can't think of a specific reason in some broad sense why some kind of piping system could not be usable for both a gas and a liquid.

Q You also mention experience with compressors. What is a compressor?

A So a compressor is a mechanical device that imparts compression, which you'd be typically thinking of as an increase in pressure on a fluid.

1 **Q Are compressors used in connection with**
2 **engines, in your experience?**
3 MR. STEMLER: Objection. Form.
4 A It depends on the type of engine, but
5 yes.
6 **Q Can you give me an example of how a**
7 **compressor would be used in connection with an**
8 **engine?**
9 A So an aircraft engine would typically
10 rely on compression of the incoming air and fuel
11 stream prior to the combustor. So an aircraft
12 engine always has a compressor upstream. Maybe I
13 shouldn't say always. Typically has a compressor
14 upstream. That's one type of engine that uses a
15 compressor.
16 **Q And so is it fair to say most, if not**
17 **all, engines rely on compression as a concept,**
18 **even if they don't have a standalone compressor**
19 **attached?**
20 MR. STEMLER: Objection. Form.
21 A I guess I would say generally, yes.
22 Right. So most engines that you think of involve

compression at some point in the process. But it doesn't strike me as something that would necessarily be required. There may be examples of engines that operate free from compression.

Q Are you familiar with the term "compression ratio" as it relates to an engine?

A Yes.

Q What does compression ratio mean as it relates to an engine?

A So I'm used to seeing that phrase with an internal combustion engine, and that would refer to the volume of the cylinder of the engine in the fully compressed condition versus the fully open condition. And that ratio of volumes is the compression ratio.

Q What is the relevance of a compression ratio when considering the operation of an engine?

A Well, I mean, it influences the combustion dynamics in the engine cylinder, if we're talking about an internal combustion engine.

1 And so higher compression ratios are more
2 difficult to design and to achieve, but lead to
3 higher forces for that particular cylinder. And
4 so if you have the same number of cylinders, it
5 would typically be associated with more power of
6 the engine.
7 But that's -- in a general sense, it's all
8 more complicated than that when you get to
9 specifics of engine design.
10 **Q Do you have a sense of what the**
11 **compression ratio for any of the prior art**
12 **systems we've discussed today would be?**
13 A So I think much of the prior art that
14 we discussed is not specific to a certain
15 compression ratio. It would be applicable to a
16 range of compression ratios.
17 The Kubota reference might provide it
18 specifically in the spec sheet. And I see on
19 page 8 of Exhibit 1012 a compression ratio of
20 9.2.
21 **Q Relative to, say, for example an**
22 **automobile engine, is 9.2 a high compression**

1 **ratio or a low compression ratio?**
2 A I don't think it's high or low, but I
3 guess I don't have the full typical range of
4 compression ratios committed to memory, so I
5 can't give you a more precise answer as I sit
6 here.
7 **Q Do you have any understanding of a**
8 **typical range of compression ratios?**
9 MR. STEMLER: Objection. Form.
10 A Yeah. I have a general understanding
11 of typical compression ratios for engines. But
12 that's -- I don't have a detailed recollection,
13 something that I've memorized.
14 **Q What is your general understanding of**
15 **typical compression ratios for engines?**
16 A That, like, high single digits is,
17 like, about what you see in typical engines, but
18 that's just a general sense, and you could have
19 higher or lower compression ratios.
20 **Q Are there any types of engines that are**
21 **outliers, in your mind, when it comes to**
22 **compression ratios?**

1 MR. STEMLER: Objection. Form.
2 A No. I mean, nothing that comes to
3 mind, as I sit here.
4 **Q Turn to page 83 of your declaration,**
5 **paragraph 171. Paragraph 171 states that**
6 **solenoid valves typically consist of a**
7 **spring-plunger design.**
8 **Do you see that?**
9 A Yes.
10 **Q Okay. Do solenoid valve always consist**
11 **of a spring-plunger design?**
12 MR. STEMLER: Objection. Form.
13 A No. I would say they typically consist
14 of a spring-plunger design.
15 **Q Can you identify an example of a**
16 **solenoid valve that does not consist of a**
17 **spring-plunger design?**
18 MR. STEMLER: Objection. Form.
19 A Well, so the term "solenoid valve" can
20 be used in a broader or a narrower way, depending
21 on the context. But there are valves that
22 actuate through an electromagnetic effect that

use a solenoid but that don't have a spring or don't have a plunger.

So you don't need to have a spring-plunger design to have a solenoid valve, but that's typically what you have for the solenoid valve.

Q Can you identify any specific examples of solenoid valves that do not have a spring-plunger design?

MR. STEMLER: Objection. Form. Relevance.

A I mean, as I sit here, I can't identify, like, a specific product name and model. But you can have a solenoid valve that doesn't have a spring, and you could have a solenoid valve that doesn't have a plunger, although typically solenoid valve has a spring-plunger design.

Q Let's go back to Exhibit 1012, please, the Kubota workshop manual. Turn back to page 65, please. And we discussed earlier that numeral 14 refers to an LPG tank, correct?

A Yes.

1 **Q And page 65 has an asterisk next to**
2 **"LPG tank." That means it's not provided by**
3 **Kubota, correct?**
4 A Yes. That's what the asterisk means on
5 page 65 of the exhibit.
6 **Q So the implication is that a person of**
7 **ordinary skill in the art would understand an**
8 **appropriate type of LPG tank to use in place of**
9 **numeral 14. Is that fair?**
10 A Well, it wouldn't be in place of
11 numeral 14. Numeral 14 is an LPG tank. And a
12 person of ordinary skill in the art would be
13 familiar with LPG tanks.
14 **Q Would understand the appropriate type**
15 **of tank to use for the system described herein,**
16 **correct?**
17 MR. STEMLER: Objection. Form.
18 A I think that there is a range of
19 potential LPG tanks that could be used with the
20 engine that's described in the Kubota reference.
21 And a person of ordinary skill in the art would
22 be familiar with a range of different types of

LPG tanks that could be used.

Q The line attached to LPG tank 14 is labeled "liquid propane line."

Is that correct?

MR. STEMLER: Objection. Form.

A Well, C is actually pointing to a line -- where C is pointing is between element 11 and the vaporizer.

Q So is it your position that the line identified as C does not extend all the way to LPG tank 14?

MR. STEMLER: Objection. Form.

A I mean, I guess I don't know what the authors of this document were trying to convey with their labeling C. But I think it would be appropriate to think of there being liquid -- of a propane line, it's going to have both liquid and vapor in that extends from the tank 14 to the vaporizer.

Q And you have that opinion even though C is explicitly labeled as "liquid propane line"?

MR. STEMLER: Objection. Form.

A The opinion that there's going to be both liquid and vapor in the line from the tank to the vaporizer, yes. It doesn't matter to me the words on the page there. That's what is going to happen, according to physics.

Q And also on page 65, the reference states that for LPG fuel, the liquid fuel stored in the LPG tank 14 is sent to the vaporizer 10 by pressure in the gaseous phase of the tank.

Do you see that?

A Yes.

Q And with that understanding in mind, is it still your position that both liquid and gaseous fuel is transmitted through liquid propane line C?

MR. STEMLER: Objection. Form.

A Yes. So that text is saying that there's liquid fuel that's being sent to the vaporizer, and that's true. There's also fuel in a vapor form that's going to be sent to the vaporizer. So it would be both liquid and vapor in the line from tank 14 to the vaporizer.

1 **Q Is that identified in the reference?**
2 MR. STEMLER: Objection. Form.
3 A Yes. I think that's implicit in the
4 reference.
5 **Q Is it explicit in the reference, or is**
6 **that something that you are interpreting from**
7 **reference based off of your understanding?**
8 MR. STEMLER: Objection. Form.
9 A Okay. Well, the -- I'm just looking at
10 page 65. There may be other relevant pages in
11 this reference and there may be other relevant
12 sections that I describe in my declaration.
13 But for starters, if we look just at
14 page 65, it identifies that there is fluid in the
15 gaseous phase in the LPG tank. And so as a
16 matter of physics, as that is pushing liquid
17 through the line, there's going to be
18 vaporization.
19 So based on this configuration, there has to
20 be vapor in the line from the tank to the
21 vaporizer. And that is something that I
22 understand and that a person of ordinary skill in

1 the art reading this reference would understand.
2 **Q When you say that "it's implicit," are**
3 **you saying that it's inherent in the context of**
4 **these structures that there's also necessarily**
5 **gas in the line?**
6 MR. STEMLER: Objection. Form.
7 A So I'm saying that the configuration
8 that's shown on page 65 of Exhibit 1012, when
9 it's operated, there's going to be vapor in the
10 line from the LPG tank to the vaporizer. There
11 will also be liquid, but there will be vapor.
12 **Q You agree with me at least that the**
13 **explicit text on the page says that the liquid**
14 **fuel is sent to the vaporizer and the gaseous**
15 **phase is in the tank, correct?**
16 MR. STEMLER: Objection. Form.
17 A I mean, I think it's a little bit of a
18 mischaracterization, right. The description is
19 accurate in that there's liquid fuel that's going
20 to be going to the vaporizer. The text does not
21 say there's no gaseous fuel, that there's no fuel
22 in the vapor phase.

1 So I don't think what I just said is
2 inconsistent with the text in any way. In fact,
3 what I said is supported by the text and the
4 diagram and the laws of physics.
5 **Q So just to make sure we're clear, is it**
6 **your testimony that in a liquid LPG system like**
7 **disclosed by Kubota, that there's always going to**
8 **be vapor in the liquid fuel line?**
9 MR. STEMLER: Objection. Form.
10 A So in the Kubota reference, there will
11 always be propane in the vapor phase between the
12 propane tank -- in the propane tank and between
13 the propane tank and the vaporizer. There is
14 also going to be propane and vapor phase in other
15 places.
16 **Q And is that true for all liquid LPG**
17 **systems? I know the prior question was just**
18 **about the Kubota reference. But is that true for**
19 **all liquid LPG systems that draw liquid propane**
20 **from the tank?**
21 MR. STEMLER: Objection. Form --
22 A I guess I can't speak to all systems

everywhere for all time, but that's certainly true of the Kubota reference and any of the propane tanks that we've been looking at in these prior art references.

Q Do you have an understanding, referring to the section of the line between LPG tank 14 and the vaporizer, what percentage of the propane will be in liquid form versus vapor form?

MR. STEMLER: Objection. Form.

A Well, the percentage will depend on the specific configuration and the operating conditions.

Q When you say "specific configuration," are there variable configurations that can be disclosed by the Kubota reference?

MR. STEMLER: Objection. Form.

A I don't think that the Kubota reference is specific to the diameter of piping or tubing that's used to connect to the LPG tank. And that will influence the fraction of propane that's in liquid phase versus vapor phase as it's flowing through. It's one of the factors that will

1 affect that.
2 So in that way, multiple specific
3 configurations consistent with the Kubota
4 reference would have differing amounts of propane
5 in the vapor versus the liquid phase. But in all
6 cases, there's going to be some propane in the
7 vapor phase in that line.
8 Q Can you narrow down that range at all
9 from "some"?
10 MR. STEMLER: Objection. Form.
11 A I don't think it can be narrowed
12 because I think it could take a wide range,
13 depending upon the specific configuration and how
14 the engine is being operated.
15 Q Do you know how the engine being
16 disclosed by the Kubota reference is operated?
17 MR. STEMLER: Objection. Form.
18 A Yes. I have an understanding of the
19 operation of that engine.
20 Q What is your understanding of the
21 operation of that engine?
22 MR. STEMLER: Objection. Form.

A Okay. So we can talk specifically about the DF972 engine. That is an engine that has a carburetor that can accommodate either a liquid fuel or a gaseous fuel, and that engine works by mixing a fuel with air and sending that air-fuel mixture to an engine where it is combusted inside cylinders, which push on a crankshaft, which generate rotary motion. That's how the DF972 engine operates.

Q So based on that understanding of the operation, how would that impact the amount of gaseous propane in LPG liquid propane line C?

MR. STEMLER: Objection. Form.

A So the operation of the engine as I describe, is consistent with a wide range of fractions of propane in the vapor phase versus the liquid phase in the line between the tank and the vaporizer.

Q And you testified earlier that you're not able to put a bound on that range?

MR. STEMLER: Objection. Form.

A It's not that I'm not able. It's that

there is not a bound that can be put on it, because it could take a wide range of values, depending on the specific operating characteristics.

Q So is it your testimony that based on the disclosures of Kubota, this system could include 99 percent gaseous propane in the liquid propane line C?

MR. STEMLER: Objection. Form.

A Yes. Absolutely. You could run the Kubota engine in a way -- so if it was, like, a very hot day, for example, but other considerations that could come into play, where you would have essentially all vapor in the line between the tank and the vaporizer.

Q And what modifications would be made to the disclosure of Kubota to end up in that situation?

MR. STEMLER: Objection. Form.

A I don't understand the question. So Kubota, as described in the reference, could have that condition.

1 **Q So your opinion is that based on the**
2 **teachings of Kubota, the state of the fuel in**
3 **line C is based on the temperature outside?**
4 MR. STEMLER: Objection. Form.
5 A So the state of the propane in line C,
6 although I'm not sure that's sufficiently
7 descriptive because I'd rather call it the line
8 from the propane tank to the vaporizer, the
9 fraction of propane in that line that is in the
10 vapor phase versus in the liquid phase will
11 absolutely be determined by the ambient
12 temperature in which the Kubota engine is run.
13 That's a matter of physics that would be
14 known to a person of ordinary skill in the art.
15 It's a fundamental principle of propane.
16 **Q And is that disclosed in the Kubota**
17 **reference?**
18 MR. STEMLER: Objection. Form.
19 A I don't know if there's -- there may be
20 spots in the Kubota reference where that's
21 described. I don't think the Kubota reference is
22 describing fundamental physics. That's not

1 mainly what it's directed at, but it's something
2 that is true and would be clear to a person of
3 ordinary skill in the art looking at the Kubota
4 reference.
5 **Q In a situation where the line contained**
6 **primarily -- the line from the vaporizer to the**
7 **LPG tank or vice versa contained primarily**
8 **gaseous LPG, would that impact the operation of**
9 **the vaporizer?**
10 MR. STEMLER: Objection. Form.
11 A It wouldn't affect in any way what's
12 coming out the downstream end of the vaporizer.
13 The vaporizer would not have to be providing as
14 much heat.
15 So the temperature difference on the coolant
16 that's coming in versus out would be different,
17 depending on the state of the propane coming into
18 the vaporizer. But the vaporizer would work fine
19 and the engine would work fine if there was
20 mostly propane in the vapor phase coming into the
21 vaporizer.
22 **Q Is that disclosed in Kubota?**

MR. STEMLER: Objection. Form.

A Yes. I think so. That's part of the whole configuration of Kubota. Everything I've said is taking the words and the diagrams in Kubota and applying knowledge of physics that a person of ordinary skill in the art would have.

Q Kubota states, "The liquid fuel stored in the LPG tank 14 is sent to the vaporizer."

And my understanding of your testimony is that you believe Kubota also teaches that gaseous fuel could be sent to the vaporizer; is that correct?

MR. STEMLER: Objection. Form.

A So the pressure in the gaseous phase in the tank is absolutely going to send both liquid -- both propane in the liquid phase and in the vapor phase through the line from the tank to the vaporizer. Yes. That's something that's inherent in Kubota.

MR. FINCH: Let's go ahead and take a short break. I'm getting close to the end, but need a few minutes to figure out where we're at.

MR. STEMLER: Okay.

(A recess was taken.)

BY MR. FINCH:

Q Dr. Morse, during the break just now or any of the other breaks today, have you discussed the substance of your testimony with anyone?

A No.

Q Turning back to the Kubota reference, do you have an understanding as to whether or not the LPG exiting LPG tank 14 is primarily liquid or primarily gas?

MR. STEMLER: Objection. Form.

A Sorry. Can you repeat the question or read it back. I just want to make sure I caught something about it.

Q With reference to the Kubota reference, do you have an understanding as to whether the LPG exiting LPG tank 14 is primarily liquid or primarily gas?

MR. STEMLER: Objection. Form.

A Yes.

Q What is that understanding?

A Well, the propane, as it's leaving the tank, in the Kubota reference, right as it's leaving the tank will definitely have some vapor, but I think it will be primarily liquid. And the amount of vapor will increase as you move further away from the tank to the point where it could be almost entirely vapor before it reaches the vaporizer.

Q Dr. Morse, we've talked about propane systems as they relate to residential grills today as kind of an example of how systems work.

Do you recall that?

A Yes.

Q If you were to use a typical residential grill and hook up a typical 20-pound propane tank to it, that would be normal operation for that grill, correct?

MR. STEMLER: Objection. Form.

A I mean, I guess we're talking about something hypothetical. So that kind of configuration is typical.

Q In that situation, if you were to turn

1 **the propane tank upside down, what would happen?**
2 MR. STEMLER: Objection. Form.
3 A Well, due to gravity, the liquid is
4 going to be at the bottom of the tank. So there
5 would be mostly liquid, but not entirely liquid
6 propane coming out of the tank. I can then
7 answer questions about what happens beyond there.
8 **Q Yeah. What happens to the operation of**
9 **the grill when it's receiving mostly liquid**
10 **propane out of the tank?**
11 MR. STEMLER: Objection. Form.
12 A I think that most grills have a safety
13 mechanism in the line from the tank to the grill,
14 such that there would be a blockage of flow in
15 such a configuration.
16 **Q So --**
17 A But it depends upon the specific
18 equipment that's being used.
19 **Q So you think the grill is specifically**
20 **designed to prevent liquid propane from entering**
21 **the grill?**
22 A Well, it wouldn't be the grill. It

1 would be -- typical configuration is that the
2 connection between the 20-pound cylinder and the
3 grill, there's a hose that has an integrated
4 regulator. And that regulator would typically
5 have some mechanism that wouldn't permit the flow
6 of significant amounts of liquid propane through
7 it.
8 **Q Do you know what would happen to the**
9 **operation of the grill in the absence of that**
10 **regulator?**
11 MR. STEMLER: Objection. Form.
12 A So if we're imagining a grill, typical
13 residential grill and we've taken out the
14 regulator, then I think that the flow rate of
15 propane out of the cylinder would be so high that
16 it would be very difficult, potentially
17 impossible, to light the grill and that would
18 represent a significant safety hazard. And it's
19 not something that I recommend doing.
20 **Q Would you be willing to attempt to**
21 **light a grill in that situation?**
22 MR. STEMLER: Objection. Form. Also

1 objection, I believe we're going out of the scope
2 of the declaration again. I'd like to be
3 directed to a portion of the declaration that
4 this question relates to.
5 MR. FINCH: I'll withdraw the question.
6 BY MR. FINCH:
7 **Q Dr. Morse, have you been involved in a**
8 **or worked on an engine or generator that runs on**
9 **a standard 20-pound propane tank?**
10 MR. STEMLER: Objection. Form.
11 A So I've worked on a project with
12 engines that could be operated using a 20-pound
13 propane tank, but in the example I'm thinking
14 about, I don't think it was. So I don't think
15 so. No.
16 **Q Are you familiar with a generator that**
17 **could be operated -- or is designed to be**
18 **operated on a 20-pound propane tank?**
19 MR. STEMLER: Objection. Form.
20 A Yes.
21 **Q And normal operation of that generator**
22 **would involve the propane tank sitting upright,**

correct?

A So I'm familiar with the generator that could be connected to a 20-pound cylinder, and where such generator operation, you would expect the tank to be upright.

Q In that situation, what would happen if the tank was upside down?

MR. STEMLER: Objection. Form.

A All right. So let's be clear here. So you're imagining that I'm not changing anything else about this product, and I'm able to operate it with the 20-pound propane tank upright, and the only thing I'm changing is I'm inverting that propane tank?

Q Correct.

MR. STEMLER: Objection. Once again, scope. I don't believe Dr. Morse discusses operating any generators in any scenario with an LPG tank inverted upside down. I'd ask counsel to direct us to a portion of Dr. Morse's declaration where this is discussed.

BY MR. FINCH:

Q Dr. Morse, do you think it is relevant to this matter that -- whether or not a generator can operate on liquid or gaseous propane?

A So I guess I want clarification on what you're talking about. You're talking about that liquid or gaseous propane as it's used in the '398 patent?

Q You submitted a declaration in connection with this IPR, correct?

A Yes.

Q As part of preparing that declaration, did you consider the fact of whether or not any particular generator could operate on liquid or gaseous propane?

A Right. So you're just distinguishing between liquid or gaseous propane. And I just want to understand your terminology, because I don't think you're using that phrase like it's used in the '398 patent, which is what my declaration is about.

Q Have I asked you any questions in the

last ten minutes about the '398 patent?

A I guess. I think you're asking me questions because they're relevant to the '398 patent, so I kind of thought everything you're asking me is related to the '398 patent, but --

Q So the questions I've been asking you think are related to the '398 patent?

MR. STEMLER: Objection. Form.

A I understood that the reason why I'm here today is so you can ask me questions that are related to my declaration regarding the '398 patent, and I can provide you with answers.

Q Dr. Morse, is it possible to operate a generator designed to operate on gaseous propane on liquid propane instead?

MR. STEMLER: Objection. Form.

A So I just want to be clear of what you mean, because the '398 patent refers to propane as a gaseous fuel, even though it's stored as a liquid.

And so if you are running a generator that the source is liquid propane, but then before it

1 gets to the combustion chamber, it's in the gas
2 phase, are you talking about liquid or gas?
3 So that's why I'm asking for clarification
4 what you mean when you talk about a generator
5 running on liquid propane versus a generator
6 running on gaseous propane.
7 Q Dr. Morse, please turn to page 65 of
8 Exhibit 1012, the Kubota workshop manual. The
9 Kubota workshop manual discloses a dual fuel
10 engine that operates alternatively on gasoline
11 and on liquid propane, correct?
12 A Right. Well, just to be clear, the
13 engine in the Kubota reference, the propane is
14 going to be in both the liquid phase and the
15 vapor phase at different points.
16 So I don't know that it's correct to refer
17 to it as a generator that runs on liquid propane.
18 Again, it depends on what you mean by "liquid
19 propane," which is why I'm asking for
20 clarification.
21 Q Let me rephrase the last question.
22 The Kubota workshop manual discloses a dual

1 **fuel engine that operates alternatively on**
2 **gasoline and on LPG, correct?**
3 A Yes.
4 **Q Okay. The LPG is stored in tank 14,**
5 **correct?**
6 A Yes.
7 **Q And the Kubota workshop manual teaches**
8 **that the liquid form in tank 14 is sent to the**
9 **vaporizer, correct?**
10 MR. STEMLER: Objection. Form.
11 A I think you might have misspoke. You
12 said "liquid form." Maybe you meant to say
13 "liquid fuel."
14 But looking at Kubota, there's going to be
15 both liquid propane and vapor propane that's
16 moving from the tank to the vaporizer.
17 **Q The Kubota workshop manual states**
18 **verbatim, "The liquid fuel stored in the LPG**
19 **tank 14 is sent to the vaporizer 10." Correct?**
20 A Yes. I see those words.
21 **Q Would the dual fuel engine disclosed by**
22 **the Kubota workshop manual be operable without a**

1 **vaporizer?**

2 MR. STEMLER: Objection. Form.

3 A It depends on the configuration. So

4 you have to explain to me what I'm doing to

5 modify it to not have a vaporizer.

6 **Q Do you see the vaporizer 10 in the**

7 **Kubota workshop manual?**

8 A I'm looking at page 65, and I see 10.

9 **Q If you removed vaporizer 10 and**

10 **connected gaseous propane line B and liquid**

11 **propane line C to one another, would the engine**

12 **be operable?**

13 MR. STEMLER: Objection. Form.

14 A Well, I think the engine would work

15 just fine on gasoline. If you try to operate it

16 in the LPG mode, the vaporizer has a

17 pressure-regulating function, so if you removed

18 it, you would have way too high of a pressure,

19 and so I don't think you could get combustion

20 because your fuel-air ratio would be way too

21 rich.

22 So I think in that configuration, it would

only be operable in the gasoline mode and not in the LPG mode.

MR. FINCH: No further questions. Thank you for your time today.

MR. STEMLER: The witness will review and sign the transcript.

THE COURT REPORTER: Can I get the transcript orders? I have realtime for both parties. Would you like rough drafts?

MR. FINCH: Yes. I'd like a rough draft.

MR. STEMLER: I would like a rough.

THE COURT REPORTER: Would you like regular delivery or expedite on the final?

MR. FINCH: What is the standard turnaround?

THE COURT REPORTER: Eight business days.

MR. FINCH: We'll take expedited.

MR. STEMLER: We'll take expedited also.

(Deposition concluded at 3:19 p.m.)

C E R T I F I C A T E

COMMONWEALTH OF MASSACHUSETTS

SUFFOLK, SS.

I, Janet M. McHugh, a Registered Merit Reporter and a Notary Public within and for the Commonwealth of Massachusetts do hereby certify:

THAT TIMOTHY L. MORSE, PH.D., P.E., the witness whose testimony is hereinbefore set forth, was duly sworn by me before the commencement of such deposition and that such testimony is a true and accurate record of my stenotype notes taken in the foregoing matter, to the best of my knowledge, skill and ability.

I further certify that the adverse party, GENERAC POWER SYSTEMS, was represented by counsel at the deposition.I further certify that I have no disqualifying interests, personal or financial, in any party in this action.

I further certify that the deposition of TIMOTHY L. MORSE, Ph.D. , occurred IN PERSON on Thursday, May 14, 2026, in Boston, Massachusetts, commencing at 8:24 a.m. and concluding at 3:19 p.m.

IN WITNESS WHEREOF, I have hereunto set my hand this 17th day of May, 2026.

JANET M. MCHUGH
Notary Public

My Commission Expires:
July 16, 2028

1

1 72:7 75:20 76:2 81:15 82:11 85:21 89:20,21 90:1,9 91:18, 21 92:17 93:8 96:1 97:5,14 98:12 99:10, 21 100:17,19 103:9 104:11,21 107:13 108:20 109:2,4 112:18

1-S33 155:19

10 75:19 76:18 81:15 94:4,8 112:4, 6,7,9 153:22 154:4 157:15 165:17 185:8 205:19 206:6,8,9

10,697,398 5:20

100 30:9,10, 12,13 36:19

1003 74:4,6 163:16

1005 70:20, 21 71:9

1009 106:13, 14,17 108:19 109:8 110:9

1012 106:5,8 123:4 133:19 147:5 179:19 182:18 187:8 204:8

1075 5:15

11 75:20 76:3,12 110:17,19 111:1,16 169:17 184:8

115 147:4 148:4 149:3 155:17

12 105:17 108:22 109:2,4 110:10,22 111:16 114:12 151:15 171:11

12-volt 132:13,16

14 98:10,12, 14 105:8 151:7,11 182:21 183:9,11 184:2,11,18 185:8,22 189:7 195:8 196:10,18 205:4,8,19

15 94:1,8,16 107:14,18,19 108:22 109:10,12

16 93:17,21 112:19,21 113:1,5 114:16,18 119:16

17 82:12,15 96:10 97:21 98:4 101:21 102:2 103:6 104:7,12 113:12,15, 16,20 114:17 115:2,6 116:4,7

171 181:5

18 96:2,6 97:21 98:4 101:1,6,10, 13 103:7 104:7,12 114:22

19 102:5,9 103:4,10,18 105:14,15

19a 102:8,12 103:11 105:13,16

19b 102:8 103:19

19c 102:8 103:11,19

2

2 110:17,19 111:22 114:6,11,22

20 6:11 8:4,8 15:3 99:22 100:2,3,4,14, 17,20,22 101:5,10,12, 19 102:2

20-pound 38:16 39:7 41:8 197:15 199:2 200:9, 12,18 201:3, 12

2003 157:21

2008 161:1,4 162:2 163:11

2009 161:3,4 162:2 163:11

2025-01271 5:19,22

21 99:11,12, 14

212 172:4

22 99:3,7

23 89:19 103:6,15,16, 21 104:14,16 105:2,9,12, 18

2a 91:20,21, 22

2b 91:20,21 92:1

3

3 114:6 136:22 143:14,22 144:8,17,18

30 6:11 8:4,8

398 26:6,16 27:1,2,5,11 29:5 63:18 64:7 65:3,10, 16 66:3,12 73:2 157:12 202:8,20 203:1,3,5,7, 11,18

3:19 207:22

3a 92:4,8

3b 92:5,9

4

4 92:17,20,21 114:6,21 135:12,17 136:8 155:4

5

5 15:2 51:15 141:14,18,21 156:6

52 165:19 166:11 167:13 168:6 169:4

52-amp 132:16

53 140:3,5

58 169:10,13

6

6 105:4,8,10, 12,20 134:7 141:14,18,20 142:11 143:9,10,11 144:1,8 145:5,12

Champion - EX2127, Page 209 of 242
Generac Power Systems, Inc. v. Champion Power Equip., Inc.
IPR2025-01271

65 133:8,19 135:16 136:22 138:12 151:6,7 182:20 183:1,5 185:6 186:10,14 187:8 204:7 206:8

68 139:6,9, 14,16 140:12,17 141:4,10,13 142:7,16 143:11 144:7 146:9,13 148:18 149:7,12 150:16,20 154:15 155:5

7

7 93:9,10 142:17,21 143:5,16 148:7,8

8

8 105:4,8 126:10,13 143:3,17,21 179:19

83 181:4

9

9 81:13,17,19 112:4,6,7,15 144:12,18 145:1 157:5, 14

9.2 179:20,22

93 140:5

962 130:17 131:12

98 30:11,12

99 31:8,9 35:21 192:7

A

abbreviation 29:1

absence 199:9

absolutely 192:10 193:11 195:15

academic 159:5

accommodate 191:3

accordance 137:21

account 166:15 176:9

accurate 6:20 45:17 79:7 187:19

accurately 113:9

achievable 48:8

achieve 49:8, 10 50:2,14 179:2

achieved 49:5 52:1

acronym 158:17

actuate 181:22

ad 59:18

add 55:22 56:10,12,18 58:16 160:21

adding 58:3

addition 15:12 57:4 150:12

additional 33:8 42:2 63:4 74:1 84:9,11 87:21 116:9 139:3,5 149:3 158:6

address 5:10,12,13, 14 65:7

adjust 93:6

adjusted 91:13

adopted 166:6,8

advantage 121:6,10,20

advantageous 51:8 119:8

advantages 120:15,18

affect 95:1 190:1 194:11

affected 175:3

affects 94:22 171:14

agree 7:5 90:2 187:12

ahead 51:17 105:22 106:11 123:4 156:21 172:4 195:20

air 85:8 87:13,14 90:6 91:9 92:13 93:12, 14,16 177:10 191:5

air-fuel 84:4 85:1,6,8,9, 11,17 86:16, 20 87:3,7,9, 16 88:2,4,16, 19 90:7,21 91:4,16 93:3, 6 122:6,7,9 191:6

aircraft 177:9,11

airflow 140:20 141:2,3,12

allowing 105:20

alternatively 204:10 205:1

alternator 133:7

ambient 55:11 57:4 60:20 193:11

amount 53:18 55:7 81:1,4,7 85:8 88:20 89:3 91:14,15 170:19 191:11 197:5

amounts 29:16 80:20 190:4 199:6

analogous 169:9

analysis 8:16 9:2,9 16:11, 14 25:12,16 64:11 65:4, 10 66:2,11, 14 74:1 161:11 162:18 165:12,13 169:19 170:10

analyzed 170:14

answering 162:21

answers 7:7 203:12

antifreeze 129:11

apologize 26:9

appeared 72:3

appears

92:16 99:21 100:17,19 108:20 112:1,19

appliance 27:16 62:2

appliances 9:11,15 10:4 32:22 35:3

applicable 125:22 167:2 168:9 179:15

application 18:6 20:13 32:15 33:16 34:5 43:2,7 44:19 45:5, 12 46:12 47:1 49:14, 16,20 50:19 51:5 52:5 53:17 54:7 55:21 56:1,5, 8 57:21 59:15 62:12, 13,20 70:14 73:19 74:16 78:10 80:1 91:2 98:7 107:11 108:16,17 126:2 136:14,19

applications 32:12,19,22 33:2,8 42:13, 17 45:1 46:5, 10 47:3,7,12, 20 48:5 51:5 54:4 56:22 108:10 125:6,7,9,13 129:20 131:4,6,8 136:15,17

applied 58:8 60:22 161:16

applies 166:11

apply 35:19 75:7 119:19 167:20

applying 195:5

approach 55:21

arbitrary 168:22

arise 67:6,19 89:8,11

arising 89:1

art 22:17 23:22 24:1, 13 25:6,9,11, 15,21 26:7 64:14,22 65:5,11,19, 20 66:7,13 75:6,12,15 77:1,10 78:6, 9 97:16,20 111:20 117:1 123:9 152:12 165:11,12,13 179:11,13 183:7,12,21 187:1 189:4 193:14 194:3 195:6

articulated 97:4

aspects 152:19

assemble 147:21

assembled 147:8 150:5

assembling 150:5

assist 117:5, 8,18,21 163:1

assisted 23:15 164:8 165:5

assisting 23:19 25:5 163:12

assists 119:13

associate 161:7

association 166:3 169:20 170:2,4

assume 81:14

asterisk 152:7 183:1, 4

atoms 28:22

attach 154:17

attached 21:7 41:7 109:12,22 145:6,19 146:10,20 154:12 177:19 184:2

attaches 110:4 139:11,19 155:3,16

attaching 109:19

attachment 109:14

attempt 199:20

attorneys 23:2 25:1 165:8

August 23:1, 3 164:8

authoring 164:9

authors 184:14

automobile 179:22

automotive 166:20 167:1

average 12:16,19

avoid 84:22 85:2

aware 48:20 49:4 56:16 67:2,10,22 68:10 95:17 96:19 97:1 108:10 111:11

B

Bachelor 158:20

bachelor's 157:19 158:4

back 15:17 22:5 34:11 40:22 61:14 86:17,21 108:19 110:9 140:12 151:6 154:15 157:4 165:17 182:18,19 196:8,14

background 12:1 21:7,8 157:11,16

balancing 128:19

barb 110:2,4 140:8 155:2

based 20:14 21:17 33:11 34:21 49:15 66:15 111:5, 14 113:22 120:13 124:16 136:13 138:10 152:19 186:7,19 191:10 192:5 193:1,3

battery 51:15 99:14,16,20 132:13,14, 16,19 133:1,

3

begins 45:15

behalf 22:7

beneficial 121:22

benefit 30:19

bigger 50:9 75:9

biodiesel 28:9

bit 93:5 139:15 156:5 168:22 172:18 187:17

black 155:20 156:3,4

block 82:20 84:15,19 101:9 129:12 134:17,21 142:2

blockage 198:14

blocked 151:5

body 150:11, 12

boil 34:8

bottom 43:10 44:11 61:17 63:12 66:19 69:19 70:4 114:7,17 126:11 139:15 140:4,21 142:7,16 147:9 149:1 198:4

bound 50:4 191:20 192:1

bowl 91:12 149:2

brass 140:7 147:15 148:9 155:21

break 7:15, 17,19 51:10, 18 106:1 153:9 156:22 195:21 196:4

breaks 196:5

bring 109:9

broad 67:15, 20 176:15

broader 10:7 136:3 173:1 181:20

broadly 171:11 175:5

broke 8:17

broken 168:2

building 78:11 137:20

bumping 55:4

burn 86:1

burning 86:3

business 207:17

businesses 16:6

butane 29:14

bypass 156:13

C

CAD 158:16, 17

call 8:15 124:1 150:10 168:10 193:7

called 30:15, 17 58:18 91:6 123:11 141:20 157:6 160:18

caption 152:1

carbon 28:22 170:13,15, 16,19 171:2, 5

carburetor 82:1,4,21 83:2,4,5,10, 13,16 84:1,3, 10,13 85:17 86:18 89:21 90:1,4,5,8, 11,13,16,20 91:3,12,17, 19 109:10 110:14,21 112:12,13 137:8 139:3, 11,20 140:6, 9,11,14,18 141:1 145:6, 13,16,17,20 146:1,4,6,7, 16 147:8,22 148:8 149:11,19 150:2,6,8,11, 14,17,18,20, 22 151:5 154:10,16, 18,22 155:14 156:5 191:3

care 19:12

career 27:22 28:5 163:10

carry 10:18 17:17

carrying 17:15 18:15

case 31:20, 22 130:3

cases 8:9 9:2 35:7 40:17 59:15 121:11 190:6

categories 175:12

category 32:17

caught 8:17 196:14

caused 67:3, 11 70:10,12

causing 95:12

center 141:4

centimeters 130:17 131:13

challenge 50:6

chamber 83:11,14,16, 17,22 84:7, 10,13,16,20 85:3,16 86:2, 9,14,19 105:21 112:13,17 140:19,22 204:1

Champion 5:18

change 33:15 34:2,6,13,22 38:4 47:14 61:16 68:15, 16 93:2 95:5, 8

changed 70:17

changing 61:18 68:1, 10 201:10,13

characteristics 20:11 31:2, 10,12 32:14 33:12 34:15, 16 38:7 45:14 47:18 49:2,20 50:18 78:14, 21 79:12 130:3 144:16 153:17 171:1 192:4

characterization 90:2

characterize 11:16,20 14:3,4,6

charger

51:16
check 24:3
checked 24:5
chemical 18:14,21 19:12
chemically 19:4
choice 20:9
choke 92:21, 22 93:2,6
choose 18:10 50:20 78:9 138:2
choosing 136:13
chose 137:22
chosen 18:19
circle 141:3,9
circular 141:8
circumstance 122:4
circumstances 61:21 62:8, 10 85:10 107:22 118:20,22 121:12,16, 19,21 137:17
cite 123:10
cited 22:17 23:22 25:21 26:7
claim 65:4,5, 6 66:3,4
claims 65:10 66:12,15
clarification 26:5 202:5 204:3,20
clarify 6:13 31:6 35:13
clarifying 26:15
clarity 160:21
classical 34:7
clear 188:5 194:2 201:9 203:17 204:12
clip 110:5
close 41:18 96:7 103:12, 20,21 105:10 112:16 134:20 195:21
closed 82:19 101:1,6 104:4,8,17 105:2 134:17 143:12,13 144:9,10 145:2,3
closer 158:8
closes 92:12 146:5
closure 171:14
cock 134:11, 14
code 165:20 166:11,17 167:2,12 169:15
codes 161:15 166:4,5 167:19
cold 54:11,17 59:16 60:20
colleague 22:22 23:6
color 147:14, 15 148:9
Columbia 158:7
column 114:11,12 126:15 127:16 130:9 131:17
combination 28:17 40:16 104:21 173:10
combined 71:8 72:8,13, 15,20 76:10
combust 93:15
combusted 44:12 191:7
combustion 9:12 11:19 12:5 31:2,10 42:6 44:19 45:1,3,5,7,8, 10 48:19 51:22 77:19, 20 87:13 107:3,7,12 108:18 121:1,3 127:2,3 129:14,17 132:11 133:6 178:11,20,21 204:1 206:19
combustor 177:11
commensurate 20:22
commercial 33:1 35:11 40:20
commercially 36:18
committed 180:4
committee 166:13
common 29:14 35:20 110:2 128:9
commonly 35:10 36:3 47:2
community 166:16
company 160:18
compared 43:21
compatibility 18:14,21 19:12
compatible 19:4
completed 161:1
complicated 31:11 128:14 141:5 179:8
component 140:8 147:13 148:9 152:2 155:22
components 15:7 76:17 77:21 140:17 146:17 147:12,14, 15,20 149:12 173:3
compressed 12:10 28:7 40:7,8 113:3, 4 115:10,12, 16 178:13
compressing 12:6
compression 113:8 129:16 176:20 177:10,17 178:1,4,6,8, 15,16 179:1, 11,15,16,19, 22 180:1,4,8, 11,15,19,22
compressor 176:18,19 177:7,12,13, 15,18
compressors 176:18 177:1
comprised 146:17

149:21

comprises 149:12 155:13

computational 162:19

computer-aided 158:15, 18

concept 72:16 177:17

concerned 18:14

concluded 207:22

condition 12:10,11 61:6 83:6,7 87:10,11 88:17 89:4 113:8 178:13,14 192:22

conditions 39:21 59:10 60:15,17 62:1 63:9 64:2 120:16, 19 128:21 189:12

conferred 161:3

configuration 15:12,13 67:8,17 70:15 81:10 85:15 122:17,21,22 123:2 128:16 132:3 142:8 186:19 187:7 189:11,13 190:13 195:3 197:21 198:15 199:1 206:3,22

configurations 70:1 128:15 138:4 189:14 190:3

configure 51:3

configured 69:7 73:1,3 84:15,19 105:9,14 121:11

confirm 72:1

connect 110:5,20 189:19

connected 96:21 99:20 103:11 105:12 108:21 110:10,11,13 111:1,4,7,16 116:5,8 201:3 206:10

connecting 90:14 112:10,11

connection 5:18,22 6:3 8:10 41:21 42:9 61:16 110:7,8,13, 19 111:1,10, 16,21 112:1, 2,12 139:13 155:8 177:1, 7 199:2 202:10

connections 147:19

considerations 18:16 37:9 47:5,9,17,22 49:15 52:7, 11 53:19 98:2 192:13

considered 64:15,19 65:8 131:5,6, 9 162:4

consist 181:6,10,13, 16

consistent 72:11 190:3 191:15

construct 97:12,17

constructing 98:8

consulting 161:7,9,19

consumer 9:11,14 10:3

contact 96:22 105:13,16 115:1

contained 64:5 194:5,7

contamination 19:5

context 26:22 29:5,6 35:18 36:9 57:10 65:8,9 66:11 67:13 76:6,20 79:4 116:12,15 126:21 131:1,3 162:4,21 170:13 181:21 187:3

contexts 17:7

continue 54:20 55:17 86:1

contribute 165:2

control 24:4 84:14,18 85:19,20 86:7,12 87:1 89:19 90:3 103:5,14,16, 21 104:14,16 105:2,9,12, 18 143:1

controlled 142:4

controlling 122:5,9 142:9

convenience 169:2

convenient 51:10 153:9

conversations 24:20

convert 57:7 98:18

converts 127:3

convey 184:14

cooking 32:21 35:3

coolant 194:15

cooling 55:10 129:12

Cooper 157:21 158:14

copy 74:3 106:6 172:6

Cornell 159:9 160:14,20

correct 5:22 13:18 15:19 25:7 26:17 27:12 28:18 35:4,17 36:21 41:2 42:11 46:7 53:11 68:20 69:20 71:10 75:22 79:1 81:13 88:18 93:18 97:6, 12 100:18 102:5 107:4 109:12 127:7 130:12,18 132:5 133:14 134:2

142:13,18 143:18 144:1,5,17 150:8 153:19,21 157:8,21 159:9 163:17 165:20 173:6 175:16 182:21 183:3,16 184:4 187:15 195:12 197:17 201:1,15 202:10 204:11,16 205:2,5,9,19

correctly 39:2 72:4

cost 18:17

counsel 20:19 51:9 63:15 153:8 201:19

count 6:10 8:7

couple 6:14 76:16 119:6 141:7

coupled 160:12

court 6:22 7:16 207:7, 13,17

cover 124:5,9 167:15,22 169:4,10 172:2

covered 152:19 167:13

covering 11:12

cranking 54:10

crankshaft 191:8

creates 55:6

credit 159:19

Cross-examination 5:6 20:21

cross-sectional 141:11

cubic 130:17 131:12

current 143:2

curve 37:22 38:2,5

cut 73:22 82:12,16,18, 22 83:3,9,12 96:2,6,9,16, 17 97:20,21 98:4 101:1,6, 8,13,20 103:6,12,13, 20,22 104:12 105:19

cutoff 141:21 143:22 144:1,16 145:5,12 148:1,3,6,10, 13 149:5 151:2

CV 21:7 172:6,8,11 175:16

cycle 33:19, 22 34:10 129:14,16,17

cylinder 12:11,12 36:1 38:17, 20,22 39:3,8, 11,15,16 40:1,7 41:8, 14,22 42:1,9 93:18,21,22 126:21 127:1 178:12,20 179:3 199:2, 15 201:3

cylinders 12:13 126:16,20 127:4,6,10, 13,15 128:7, 9,17 129:15 132:1 179:4 191:7

D

day 54:11 59:16 192:12

days 207:18

decided 127:14

deciding 20:6

decision 51:2 168:11

declaration 5:21 6:4 20:20 21:2,5 22:16,17 23:10,12,16, 22 24:2,3,8, 10,12,14 25:21,22 26:3,7,8 63:16 64:5, 10,11,16,18 65:9 66:8 73:13 74:2,4, 10,14 102:15,19 111:10 117:12 119:5 120:14 124:10,19 126:8 139:22 140:4 145:10 154:21 156:19 157:5 162:7,10,15 169:17 172:5 181:4 186:12 200:2,3 201:21 202:9,12,21 203:11

decorative 33:5

decrease 19:22 91:8,9 92:14 170:19

define 11:7

definition 119:19

degradation 19:8 77:21

degree 158:2,4,20 159:22 161:3

degrees 159:12,13

delay 85:2 86:8,19

delivery 207:14

denser 44:5

density 43:8, 20 50:12

depend 22:2 49:1 62:1,12 67:7 78:20 80:15 130:2, 7 136:18,20 189:10

depending 18:13 19:7 20:10 33:21 34:14 53:18 62:20 80:20 83:5 85:15 91:1 119:18 121:11 181:20 190:13 192:3 194:17

depends 12:20 18:9, 12 20:3,4 31:11 39:13, 15 45:12 55:20 66:1, 22 78:14 79:22 80:7 87:5 88:12 114:7 131:1, 2 173:20 177:4 198:17 204:18 206:3

depict 100:17

139:17

depicted 110:15 143:11 148:1 151:7

depiction 146:3

depicts 89:21 92:16 93:8 98:9 102:4 111:22 139:19

deposed 6:6 8:3 22:7

deposes 5:5

deposition 22:6,15 23:17 25:2, 18 64:4 207:22

describe 88:10 102:16 111:10 119:2 120:12 139:10 140:13 186:12 191:15

describes 117:11

describing 62:14 104:22 193:22

description 76:21 113:9 115:5,7 187:18

descriptions 115:4

descriptive 193:7

design 50:18 54:5 123:16 127:12 128:10 130:2 153:17 158:9,15,18 170:18 171:12 179:2,9 181:7,11,14, 17 182:4,8, 17

designed 57:12 58:19 59:11 63:10 66:17 95:11 198:20 200:17 203:14

designer 50:19 134:18 135:5

designing 18:17 176:10

designs 161:16

desirable 121:14

detail 25:12, 15

detailed 31:13 180:12

details 136:4 156:17

determine 137:17

determined 193:11

determines 143:21

develop 166:17

developing 158:15 165:18 168:18

develops 166:4

deviations 72:6

device 57:11 58:13 90:5 116:13 172:22 176:19

devices 168:3

DF 134:4

DF972 124:13,22 125:2 133:22 142:9 191:2, 9

DF972-E2 124:6

DG972 124:14

DG972-E2 124:6

diagram 97:6,8 133:17,20,21 140:12 142:5,7,13 154:16 188:4

diagrams 133:14 195:4

diameter 20:5 189:18

dictate 34:1

dictated 51:4 122:16

dictating 122:10

diesel 28:8, 10

difference 17:19 30:22 50:10 94:14 95:20 124:8 131:19 133:16 172:16 194:15

differences 11:3 17:9 94:6,10 95:13,16,22 96:14,19 97:1,3 124:15 129:19 173:14 176:12

differing 190:4

difficult 179:2 199:16

digits 180:16

dimensions 14:5 138:1

direct 21:1 63:16 152:11 201:20

directed 194:1 200:3

direction 20:1 85:4 86:10 138:21 164:10

disagree 54:3

disagreed 165:14

disagreements 165:15

disassembled 146:18 149:5 150:5

disclose 113:4 117:7 146:19

disclosed 65:18 66:7 73:8 74:12, 21 77:11 78:1 79:4,15 107:7 109:7 118:16 120:9 125:2 132:19 137:10 188:7 189:15 190:16 193:16 194:22 205:21

discloses 65:20 74:16 79:1 94:1 99:2 138:18 204:9,22

disclosure 111:5,14 192:17

disclosures 192:6

discuss 25:2 117:12 145:10 165:9

discussed 20:20 24:1, 13 69:17 70:2 123:5 130:10 135:20 139:10 165:11 179:12,14 182:20 196:5 201:21

discusses 123:15 201:17

discussing 23:16 72:17 154:16

dishwasher 10:5

displacement 11:10,14,21 12:3,9,10,16 13:5,11,17 14:2 74:18, 21 75:2,4 130:10,14,17 131:12 137:22

disposed 105:11

dispute 8:22

distances 173:3

distinction 59:7

distinguish 36:7

distinguishes 119:22

distinguishing 104:5 202:16

distribution 16:9

divided 14:10

doctoral 158:21 159:8 161:2

document 70:19 71:3, 12 72:7 73:13,15 106:5,12,19, 22 123:8 151:18,19 152:5 156:19 184:14

documents 25:17,20 26:1

double 60:3, 7

downstream 63:4 134:10 135:11 139:1 151:11 154:10 194:12

draft 163:19 164:19 207:11

drafted 164:21

drafting 165:5

drafts 207:9

draw 42:18 43:5,10 48:10 53:8 63:12 66:19 69:3,7,10,17 70:3 81:22 82:3 113:16 114:18 140:21 188:19

drawing 41:22 42:10, 15 43:19 44:15 46:1 48:8 53:20 55:5,8,13 59:5 60:13 61:4,11,17 67:3,11 69:15 76:11 97:11,15

drawn 44:21 45:14 52:21 54:12 61:2 85:16 86:15 91:15 115:18,22 119:15 168:19

draws 43:2 44:10 60:9 61:15 91:11

drive 56:8 125:12

driven 47:16, 17 79:12 95:20

driver 95:21

driver's 5:4

drives 12:8 95:21

driving 50:10 126:1

drop 115:11

dryer 10:5

dual 26:17,20 27:3,9,19,21 28:4,12,16 31:17 68:20 72:16 73:5 78:13,16 80:10 124:13,22 127:6,10,20, 22 134:1,5 171:6,9,10 204:9,22 205:21

due 19:9 53:21 113:8 198:3

duly 5:3

dynamics 162:19 178:20

E

earlier 13:16 15:18 24:7 26:10 31:16 38:10 46:5 55:16 59:4 68:19 69:17 72:17 74:17 88:15 89:20 107:20 130:10 135:20 182:20 191:19

early 161:3

easier 93:4 175:7

edits 164:11, 13 165:2 166:14

educational 157:15

effect 20:2 91:7,14 174:16 181:22

effects 33:7 174:19

efficiency 87:19 120:21

efficient 46:16 60:5,6

effort 30:10, 14,18

elastomeric 110:3

elbow 155:21,22

electric 132:5,10

electrical 56:18,20 142:8 143:2

electromagnetic 181:22

electronics 10:4

element 76:3 81:16 141:22 142:1 184:7

elements 65:4,5,6 84:9,11 97:7

embodiment 111:22

employed 23:7 159:6 160:15,17

employee 160:22

emptying 46:15

end 55:13 109:11 110:10 116:4 141:22 192:17 194:12 195:21

endpoint 138:19,21,22

energy 127:3,4

engine 11:10, 14,17,19 12:3,5,8,17 13:5,11,17, 18 14:2,7,9 15:12 26:17, 20 27:3,6,9, 15,18,19 28:16 31:1, 17,21 33:3 49:1,22 51:22 52:7, 16 54:7,15, 21 59:5 60:9, 13 61:3,10 63:10,21 65:11,18 66:17,22 67:7,13,17 68:2,12,20 69:1,3 70:6, 16 71:8 72:8, 13,15,16,20, 22 73:3,5,8, 17,20 74:11, 16,19,21 75:2,4,8,10 76:10,16 77:21 78:11, 13,17,21 79:1,4,15 80:15,16 83:6,8 86:1, 13 87:3,20 89:16,17 90:14,20 91:3 92:14, 15 93:3,4,7 96:8 97:12, 17 98:8 99:9 100:16 101:17 107:7,12 108:18 109:7 114:22 115:3,14 116:16,19 119:8 120:22 121:2,5,8,14, 19 122:1,10, 11,17,19 123:3 124:8, 12,13,15 125:2,9,15, 20,21 126:3, 5 127:1,7,10, 12,15,21,22 128:4,10,17, 20 129:2,3,4, 12,13,18 130:8,11,15, 21 131:5,7, 10,11,14,15 132:2,11,12 133:4,5,6,7 134:4,5,19 135:8 136:19,21 137:20,22 138:11 140:6,20 146:3 152:19 156:12 170:18 177:4,8,9,12, 14 178:6,9, 11,12,18,20, 22 179:6,9, 22 183:20 190:14,15, 19,21 191:2, 4,6,9,14 192:11 193:12 194:19 200:8 204:10,13 205:1,21 206:11,14

engineer 8:18 12:1 23:5,13 24:6 49:14

engineered 59:20

engineering 9:1 20:12 21:19 24:3 50:6 97:11, 15 157:20 158:20 161:8,17,20 162:20

engines 23:14 27:22 28:4,6,8,10, 12 48:19 52:8,15 67:22 68:10 75:15,16,18 77:19 80:10 82:2,7,9 107:3 123:17,20 124:16 129:21 134:2 170:22 177:2,17,22 178:4 180:11,15, 17,20 200:12

entail 15:22

entering 98:21 154:7 198:20

enters 140:19

entire 15:11

entirety 164:15

equations 21:20 22:2

equipment 9:11,12 33:4 51:4 54:20 55:17 125:18 198:18

equivalent 132:17

errors 24:3

essentially 15:14 36:15 49:9 150:15 163:4 192:14

ethanol 80:20,21 81:1,4,7,9

evaluated 67:1,8 170:18,21

eventually 16:22

exact 87:12

Examination 21:1

examples 8:13 19:11 33:17 34:20 69:22 122:12,14 131:8 176:4 178:3 182:6

exchanger 116:9,11,14 117:2,15 118:16 119:10,12 120:9 172:16,19

exchangers 172:14

exchanges 116:13

exclude 168:3

excuse 128:22

exhaust 114:21

115:2,15 116:8 171:3

exhibit 70:20, 21 71:9 74:4, 6 106:5,8,13, 14,17 108:19 109:8 110:9 114:8 123:4 133:19 147:5 155:18 156:7 163:16 179:19 182:18 183:5 187:8 204:8

exist 11:13 38:8 130:6

exists 64:13 168:8

exiting 196:10,18

expanded 12:11

expands 12:7

expect 59:9 78:6 79:19, 20 80:8 140:1 152:18 167:19 201:4

expectation 32:1

expecting 175:2

expedite 207:14

expedited 207:19,20

expels 129:17

expensive 30:7,14

experience 21:6,13 22:6 27:21 28:4, 13 31:17 56:13 130:21 132:8 157:7, 11 172:14 173:5,8,11 175:15 176:5,17 177:2

experimental 162:17

expert 8:17 22:10 162:7, 10,15

expert's 64:1

experts 163:1

explain 33:13 43:14 88:7 102:7 165:22 172:15 206:4

explicit 186:5 187:13

explicitly 168:8 184:21

exploded 8:16

exploring 160:12 170:13

explosion 17:1 161:13

Exponent 23:1,6 24:5 160:18,22 161:5 162:3, 12

extend 184:10

extended 70:17

extending 114:17

extends 45:20 114:16 148:19 184:18

extension 155:12,15

extent 67:18 167:21

external 55:22 56:10, 12 57:1,12 58:4,7,16,19 59:16 60:22

extra 30:10, 18 59:10,12

F

facility 9:8

fact 36:3 176:10 188:2 202:13

factors 189:22

failure 8:15, 19 9:2,7,9 16:10 19:10 161:11,14

failures 16:16 161:13 162:17

fair 7:9,13 39:17 50:17 76:10 85:22 122:15 177:16 183:9

fall 161:1 167:9

familiar 6:12 29:1 30:3 40:1,5 42:17 46:10,13 47:7 71:2 75:15 88:7 178:5 183:13,22 200:16 201:2

faster 48:18 53:9 57:16

feed 137:1,4, 9

feel 73:14 74:9 174:18

field 161:8,19

figure 75:20 76:2 81:12, 14,15,16 82:11 85:21 89:20 90:9 91:18,21 92:17 93:8 96:1 97:5,14 98:12 99:10, 21 100:17,19 103:9 104:11,21 107:13 108:20,22 109:2,4 110:17,19 111:22 112:18 134:6 138:12,17 140:4 141:4, 10,13 142:5, 16 145:4 146:8,14 147:6,9 148:22 150:16 152:2 154:20 155:5 195:22

figures 71:20,22 72:1 110:16 140:17 146:20 147:11 148:2 149:7

fill 39:15 86:19

filling 46:15

filter 76:19, 20 77:1,10, 13,15,22 78:2,6,10,17 79:3,11,17 80:3,4 81:2, 5,10 94:1,4, 16,18,19,22 95:1,3,5,8,9, 10,12,14,17 116:9 135:12,18,19 136:4,6,8,13, 16 151:10,15 152:1,5,8,12, 16,18 153:2, 18

filtered 94:16

filtering

94:12,13,15

filters 77:2 78:3,12 94:11 153:6, 7

final 207:14

Finch 5:7,18 21:4,14 51:12,17,20 63:18 64:8 70:19 71:1 74:3,8 105:22 106:3,10,16 153:11,14 156:21 157:3 195:20 196:3 200:5,6 202:1 207:3, 10,15,19

fine 5:14 61:22 70:16 194:18,19 206:15

finger 140:10

finish 7:7,18

fire 8:17 161:13 166:2

firm 23:6 165:8

fitting 155:13,15

five-minute 51:18

fixed 10:16 11:1,3,7

flames 33:6

flip 145:11

float 83:11, 14,16,17,22 84:7,10,13, 16,20 85:3, 16 86:2,9,14, 19 91:11 105:21 112:12,13,17 140:19,22 149:2

flow 18:10 19:13,16,20 20:1,2,7,14 21:11,17 43:7,14,16 44:2,3,5,7,8 46:6,11 47:4, 9,16,22 48:8, 14,15,21,22 49:4,10,16 50:2,8,15 52:1,7,22 54:5,18 56:6 82:9,20 83:4, 5,9,13 86:18 91:7 96:7 101:12,18 112:7,9,16 121:13,22 122:8,9,13, 16 134:17,21 135:2,6,10 140:22 142:2,3 148:20 149:1 152:17,21 155:7 160:4, 5,9,11 176:1, 3,6 198:14 199:5,14

flowchart 97:5,9

flowing 18:11 43:20 51:7 52:6,10,14, 17 77:3 121:5,7 143:2,6 189:21

flows 68:16 83:1 91:10 175:20,21

fluid 17:18, 20,21 18:2,5, 13,19 19:5,6, 8,16,20 20:3, 11,12,15 21:18 22:1,3, 4 32:13 33:11 34:2, 12,18,21 57:2 81:8 94:21 95:21, 22 122:21 129:11 160:7,12 162:19 171:13,14, 19,21 172:1, 3,21 173:9 174:22 176:8,22 186:14

fluids 173:2 175:19

focus 124:18

Foley 165:8

follow 151:22

footprint 128:20

forces 58:8 160:10 179:3

form 5:4 11:5 13:13,19 17:11 18:1,7 19:1,18 20:17 25:13 26:21 28:1 29:20 35:8 37:13 38:15 39:12,20 40:13 41:3, 12 42:12,20 44:13 45:18 46:8 47:10 48:6 49:6 51:1 53:12 54:1 55:19 57:9,19 60:11 61:20 62:5 63:14 65:1,13,15, 21 66:21 67:5,14 68:3, 13,21 69:12, 21 70:7 71:18 72:18 73:10 76:1,7 77:6,17 78:19 80:11 81:20 82:5, 17 86:4 87:4 88:5 90:17 93:1 94:7,20 95:2,19 96:11,15,20 97:2,13,22 98:5,15,19 99:17 100:6 101:14,22 102:10,14 103:8 104:10,20 107:9 108:3, 12 109:16 110:12 111:8,17 113:14,18 115:20 116:6,20 117:9 118:1, 5,12,18 119:11,17 120:10,20 121:9,17 123:14 125:4,10 126:9 128:18 130:13,22 132:9,21 133:2,18 134:3,15,22 135:7 136:10 137:6,12,19 138:7,20 139:12 140:15 141:19 142:6,14,22 143:8,19 144:2,6 145:8,15,21 146:12,21 149:9 150:9 152:14 153:20 154:5,19 155:11 156:16 158:22 162:1,8 163:7,22 164:20 165:3 167:10,17 168:4 169:6 171:22 172:10 173:17 174:7 176:7 177:3, 20 180:9

181:1,12,18 182:9 183:17 184:5,12,22 185:16,20 186:2,8 187:6,16 188:9,21 189:8,9,16 190:10,17,22 191:13,21 192:9,19 193:4,18 194:10 195:1,13 196:12,20 197:18 198:2,11 199:11,22 200:10,19 201:8 203:8, 16 205:8,10, 12 206:2,13

four-cycle 127:22 129:2,4,7,13, 15,20 130:5, 7

four-cylinder 127:21

fraction 39:14 189:20 193:9

fractions 191:16

frame 150:7, 10 162:2 163:11

free 73:14 74:9 178:4

freezing 95:12

frictional 19:21

fringe 40:17

fuel 12:6,7 26:17,20 27:3,7,9,19, 22 28:4,12, 16 30:6 31:17 32:10, 11,20,21 33:2,5,6 35:3 36:18 37:7 43:5 53:3 55:2,7 65:7, 13 66:7 68:1, 5,6,7,11,20 72:16 73:5 76:12 78:13, 16 80:10 81:22 82:3 84:3 85:7,8, 16 87:12,14, 15 88:10,20 89:3,8 90:6, 14,21 91:5, 11,15 92:13 94:12,13,14, 16 96:22 101:4,18 102:4,8 103:4,17 105:10,11, 13,15,19 107:2 109:5, 6,9,11,19,21 110:3,10,20, 22 111:15 113:2,3,5,7, 15,16,17 114:17,20,22 116:17,19 117:6,8,19, 22 119:7,10, 13,15,20,22 120:1,2,4,8, 17,19,22 121:3,4,7,13, 22 122:1,8, 13,16,22 123:1,2 124:13,17,22 127:6,10,20, 22 131:22 133:9 134:2, 5 135:12,17, 19 136:8,21, 22 137:4,9, 15 138:1,3,5, 8,9 139:10, 19 143:2,17, 21 148:20 149:1 152:10,17 153:1 154:11 156:2 165:19 166:18 171:7,9,10, 20,21 172:2 177:10 185:7,14,18, 19 187:14, 19,21 188:8 191:4,5 193:2 195:7, 11 203:19 204:9 205:1, 13,18,21

fuel-air 206:20

fuel-lean 89:6,7,9,14, 15,18

fuel-rich 88:21,22 93:5

fueling 173:9

fuels 27:8,14, 15,18,20 28:3 30:19, 20 63:20,22 64:3 85:1,3 86:10 123:18

fugitive 17:1

full 5:9 6:19 11:12 82:7 83:11 136:4 167:21 180:3

full-time 160:22

fully 16:4 178:13,14

function 38:5 206:17

functionality 96:12

fundamental 193:15,22

fuzzy 168:22

G

gas 9:11 15:19 16:3,5, 8,14,17,20, 21 17:1,2,6, 9,14,15,22 18:4,12 19:15 20:15 21:12,18,21 22:4 28:7 29:7,8 30:16 33:20 38:9, 21,22 39:3,4, 6,14,18 40:7, 8,11,15,16 41:17,18 42:1,5,7,10 44:4,6,7 45:4,9,22 49:11 50:2, 12,13,16 63:6 68:16 83:1 98:21 99:1 113:20 114:19 115:6,10,13, 16,18 116:1 120:6 124:14 156:1 165:19 166:12,18 167:16 169:14 171:21 172:3 173:21 174:3,11,14, 22 175:8,11 176:2,3,10, 16 187:5 196:11,19 204:1,2

gaseous 39:10 41:2,9, 10 43:21 49:5 50:20 52:2 53:8,18 55:5 57:8 59:5 61:15 63:11,19,20, 22 64:3,13, 20 65:7,13, 21 66:7,18 67:4,12 68:1, 5,6,11 69:4, 8,18 90:14 98:18,20 107:22 113:7,16 114:16,20

116:17,19 117:6,8,19, 22 119:7,10, 13,16,20,22 120:1,3,17, 19 148:1 154:11 156:2 173:9,12,15 174:5 175:19 176:6 185:9, 14 186:15 187:14,21 191:4,12 192:7 194:8 195:10,14 202:4,7,15, 17 203:14,19 204:6 206:10

gases 44:5 115:2 174:18 175:20

gasoline 28:7,11 31:18 68:7 69:2 73:1,4 75:21 76:4,6, 8,11,12,15 77:3,5,11,14, 16 78:13,15, 22 79:10,13, 14,19,21 80:9,20,22 81:2,5,7,9,22 82:2,8,9,12, 16,18,20,22 83:3,4,8,9, 12,13 84:16, 20 85:2,14, 22 86:2,9,14, 18,21 94:9, 19 95:3,4,14, 18 96:9,17, 18 97:21 98:4 99:9 101:20 103:6,13,20 104:12 105:13,16, 17,20 107:19 108:1,2,4,5, 11,16 109:19,22 110:11 124:12,14 134:1,4,7,11, 14,17,21 135:2,6,9 137:7 138:1, 10,13 139:2 140:11,13, 18,21 141:21 142:2,3 144:1 145:5, 12 148:3,5, 10,12 149:5 151:1 204:10 205:2 206:15 207:1

gasoline-lpg 71:8 72:8,13 76:9

gasoline-propane 28:16 68:20

gave 33:9 38:10 159:18

Generac 22:7

Generac's 24:22

general 14:20,22 48:4 72:16 127:11 175:11 179:7 180:10,14,18

generalize 16:4

generally 15:4 17:5,8, 21 26:16 27:1,10,17 29:11 31:10 36:14 40:19 42:22 43:12 44:4,8,9 46:9 48:14 53:14 71:19 72:12 75:15 77:9, 18 83:16 84:1,8 90:15, 18,19,22 91:17 100:8, 10 107:21 109:18,21 119:6 125:11 126:3 129:22 132:22 136:11 141:9 153:21 157:13 171:16 177:21

generate 34:8 91:10 125:12 133:5 171:2 191:8

generated 121:2 170:20

generation 34:7 170:15

generator 10:17 11:3,4, 7,9,18 13:5, 12 15:1,3,8, 13,15 31:21 33:3 78:17 169:19 170:15 200:8,16,21 201:2,4 202:3,14 203:14,21 204:4,5,17

generators 10:6,10,11, 16,17,19,22 11:2 12:15, 22 14:18 15:6 23:14 170:3 171:7, 9,10 201:18

geometrical 128:20

geometry 70:16 139:4

give 6:19 8:13 43:1,4 67:16,19 108:15 122:3 177:6 180:5

giving 26:10 36:10 79:7

goals 95:9

good 5:8 7:20,21

Gould 23:2

governs 169:15

graduated 160:14

graduation 160:20

gravity 174:16,19,20 175:3 198:3

greater 163:13

grill 36:2 38:11,18 41:1,7,10,14, 20 42:14 61:14 62:3 197:15,17 198:9,13,19, 21,22 199:3, 9,12,13,17, 21

grills 197:10 198:12

guess 15:14 32:16 45:11 47:19 59:7 65:2 105:7 116:2 149:10 155:18 170:5 174:8 177:21 180:3 184:13 188:22 197:19 202:5 203:2

guidelines 6:14

H

hand 70:19 74:3 106:4, 12

handed 123:6

handle 10:18

happen 58:2, 6 63:8,13 66:20 101:15

185:5 198:1 199:8 201:6

happening 45:3,6,10 58:1,14,22 59:1 95:5

happy 103:2

hard 9:17,21 110:6 147:3

harder 89:17

hazard 199:18

head 108:5,6

heading 156:7

heat 48:1 55:12,22 56:10,12 57:1,2,3,12, 13 58:4,16, 19 59:10,12, 16 60:22 115:14 116:9,11,13, 14,16,17,18 117:2,15 118:16 119:9,12 120:8,9,16, 19 129:11 172:14,16, 19,20,22 194:14

heated 115:1

heating 27:16 32:22 33:1 35:3 56:18,20,21 117:5,8,18, 21 119:7,10, 13

heavy 125:12,16 126:1

helpful 154:21

hey 54:9,13

high 15:21 26:19 30:7 48:9 54:18 56:5 58:15 122:7,11 165:22 171:4 179:22 180:2,16 199:15 206:18

higher 30:18 43:7,9,13,20 44:6 46:6,11 48:13,15,20 49:4 50:8,13, 15 51:22 52:22 81:7 88:20 121:2, 13,19 122:12 171:3 179:1, 3 180:19

hoc 59:18

holding 140:9

holds 76:8 93:22 113:3

Holzapfel 107:1,8,10 109:20 110:16 111:3,5,14, 20 112:3,18 113:4,12,19 114:1,6,15 115:5 117:2, 7,10,15,22 118:3,7,10, 14,17 119:2, 12,15,21 120:9,12

Holzapfel's 114:9,10

home 5:12 38:11

hook 197:15

hoping 51:16

horizontal 128:13 155:6

horsepower 14:14

hose 110:2 155:2,19,20 156:3,4 199:3

hot 115:2 192:12

hour 24:21

hours 132:17

house 36:3

household 10:4

HVAC 9:11

hydrocarbon 28:21 30:8

hydrocarbons 29:10,12,19

hypothetical 44:14 197:20

hypothetically 63:8

I

I-4 126:11

i.e. 68:6

idea 58:3 168:1

identification 5:4

identified 81:16 142:10,12,15 184:10 186:1

identifies 38:3 74:15 86:6 186:14

identify 13:2, 4 140:1 173:22 181:15 182:6,12

identifying 73:19 88:13 125:5

igniting 12:6 131:22

ignition 16:22 100:4, 5,8,10,12,13 131:18,19,21

image 139:15,18 148:4,15,17 150:19 151:1 155:19

images 139:3,5,9 149:3 150:21

imagine 41:15 44:14 49:14 58:10

imagining 41:13 45:19 199:12 201:10

immediately 45:16 46:2 160:19

impact 15:8 18:5,20 64:12,20 65:3 77:20 81:2,5 83:8 87:2 102:7, 12 103:5,14, 17 128:16 136:1 152:22 153:1,18 191:11 194:8

impacted 19:13 20:14 21:17

impacts 121:1 160:11

imparts 160:9 176:20

implemented 56:9

implementing 78:16

implication 183:6

implicit 186:3 187:2

implies 88:22

imply 87:17

importance 37:11

important 18:21 19:17 36:11 77:15 116:18,21 117:21 118:2,4,8,11, 15,17,19,21 119:1 120:8, 11

impossible 199:17

improper 122:7

improperly 170:16

improve 166:15

impurities 77:2,4,13,16, 19 79:18,20 80:1

impurity 77:8

incidents 166:17

include 59:9 84:18 87:19, 20,21 107:21 108:2 118:6, 7 166:20 168:2,7 192:7

included 29:13,16 117:2 118:4, 10,14 161:10

includes 29:19 82:9 84:14 99:16 117:15 157:10

including 142:10

incoming 177:10

inconsistent 188:2

incorporated 70:22 74:7 106:9,15 145:13,22 146:4,5

incorrect 36:1

increase 50:11 56:10 58:4,6,20 92:14 120:21 121:4,6,14 170:19 176:21 197:5

index 140:10

industrial 9:7 32:13 33:1,4, 11,14 34:5, 21 40:19 125:18

industries 166:10

industry 35:21

inefficient 60:6

influence 175:12 189:20

influences 178:19

information 97:17 136:6 147:7,10 151:17 152:4,15

inherent 187:3 195:19

initially 132:11

inlet 110:13, 18 111:1,16 112:11

input 166:16

inside 40:14 46:2 57:17 58:1,7,9 116:1 148:22 149:1 191:7

instance 22:9 42:8 49:12 152:13

instances 53:8

insufficient 59:21 60:1

intake 84:16, 20

integrated 199:3

intellectual 8:20

intended 53:4 60:7

intention 52:5,9,17

intentionally 61:4

interact 168:16

interacted 170:5

interaction 160:4,6,7

interactions 19:9

interchangeably 36:16

internal 11:19 77:18 107:3,7,12 108:17 178:11,21

international 170:8

internationally 80:19

interpretation 101:11

interpreting 186:6

intervene 105:11

intervening 159:3

invention 72:8 87:1

inverted 201:19

inverting 201:13

investigating 161:12 162:16

involve 9:7 16:7 17:14, 16 161:21 173:1 177:22 200:22

involved 9:5, 10 10:15 16:13 69:1 158:15 161:17 164:17 200:7

involving 10:6,10,21 16:3,5 161:18

IPR 5:19,22 22:11 202:10

issue 10:12 55:1,16 59:21 60:1 66:9 84:10, 12 86:5 175:4

issued 162:10,14

issues 67:19 87:19

item 81:12

J

Japanese 71:7,14,20, 22

joint 159:11

judgment

168:10

jumped 106:11

jurisdictions 166:7

K

key 168:18

kilowatts 11:11 14:14 15:2,3

kind 12:16 31:6 33:4 40:14,21 44:18 47:20 54:22 57:20 87:22 97:10 139:14 147:3 176:15 197:11,20 203:4

kinds 10:3 48:5 88:3 161:10 167:7

knowledge 21:9,11 153:3 195:5

knowledgeable 23:14

Kubota 123:12 125:20,21 126:5,10,13, 22 127:14 129:1 133:4 136:5,7,16 137:13 139:3 149:3 152:3 179:17 182:19 183:3,20 188:7,10,18 189:2,15,17 190:3,16 192:6,11,17, 21 193:2,12, 16,20,21 194:3,22 195:3,5,7,10, 19 196:8,16 197:2 204:8, 9,13,22 205:7,14,17, 22 206:7

Kubota's 136:8

L

label 93:10 127:16 148:7

labeled 75:20 76:3 81:12 89:21 90:8 91:18 92:4, 17 93:9 96:2 99:3,11,21 108:22 112:19 126:11 133:9,20,21 135:12 136:22 138:13 141:14,18 153:22 154:20 184:3,21

labeling 184:15

labels 91:20 131:17

language 102:22

large 53:18 130:20 131:7,9,15

larger 15:2,5

law 165:8 166:6,9

lawn 131:14 167:8,13,16, 20,22 168:3, 7,9

laws 50:6 188:4

lead 19:10 50:19 86:15 114:3 115:15 122:6 179:2

leads 75:12 113:21 126:5

leak 16:20,22 19:10 175:6

leakproof 175:8,11

learned 166:16

leaving 197:1,3

left 114:12 126:15 127:16 130:9 131:17 133:20 155:21

leftover 87:14

lessons 166:16

Lester 5:11

level 15:21 26:19 39:15 84:2 85:2 86:8 159:17 165:22

levels 87:6

license 5:4

light 199:17, 21

limit 49:9 50:1 55:4,6

limited 75:1, 4,9

limiting 35:15

limits 55:1 75:17

lines 66:11 138:1 168:19

liquid 17:3,6, 10,16,21 18:4,11,15 19:9,15 20:16 21:12, 18,22 22:4 29:7,8 33:20 35:10 36:21 37:3,8,10,16 38:8,13,19, 21 39:3,4,5, 10,14,19 40:7,11,16 41:9,10,16 42:4,18 43:2, 6,9,19 44:3, 6,10,11,15, 16,17,22 45:6,13,15, 20,21 46:1,3, 17,19,21,22 47:4,8,13,16, 21 48:11,12, 13 49:17,18 50:21 51:6 52:6,9,14,17 53:2,9,21 54:12 55:13 57:5,7 60:9, 13 61:2,4,11, 17 62:16,19 63:1,12,19, 20,22 64:3, 12,20 65:7, 13,21 66:7, 19 67:3,12 68:1,5,7,11, 16 69:3,10, 15,19 70:4, 18 90:6,21 91:4,11,15 95:4,7 98:18, 22 107:21 108:2,9 109:9 113:16,20 114:18 115:6,17,21 119:16,22 120:5 140:17 148:20 154:7 171:20,21 172:3 173:9, 12,15,20 174:1,2,5,11, 13,21 175:4, 8,10 176:2,3, 6,12,16 184:3,16,17, 21 185:2,7, 13,14,18,21

186:16 187:11,13,19 188:6,8,16, 19 189:8,21 190:5 191:4, 12,17 192:7 193:10 195:7,16 196:10,18 197:4 198:3, 5,9,20 199:6 202:4,7,14, 17 203:15, 20,22 204:2, 5,11,14,17, 18 205:8,12, 13,15,18 206:10

liquids 44:4 174:19 175:18,20

liquified 113:3,5,8 169:14

list 33:8

listed 76:18 82:11 96:1 144:11 157:6

lists 93:18 127:5 132:13

litigation 161:22 162:5,14,22 163:6

located 86:2

location 80:21 142:1 155:8

locations 80:18

long 24:18 45:11 54:13 62:21 162:6

longer 173:3

looked 71:20 136:5

losses 19:22

lot 125:18 168:8

lots 11:6 50:14 159:19 173:19

low 37:17 180:1,2

lower 37:8 44:3 121:22 180:19

LPG 29:2,4, 18 30:17,21 31:1,3,7 32:2,5,9,20 33:10 34:3, 21 35:2,6,15, 20 36:4,16 73:1,4 85:15, 22 86:3,13, 21 93:9,11, 12,13,15,18, 20,22 94:8, 17,18 95:6, 10,14,18 96:2,5,8,16 97:20 98:4, 16,18,20,21, 22 99:9 101:1,6,9,12, 13 103:6,12, 22 104:12 113:10 124:14 143:22 144:12,16 145:1 151:7, 10,11,15 152:1,8,12 155:16 169:4 171:7 182:21 183:2,8,11, 13,19 184:1, 2,11 185:7,8 186:15 187:10 188:6,16,19 189:6,19 191:12 194:7,8 195:8 196:10,18 201:19 205:2,4,18 206:16 207:2

lunch 153:9 156:22 157:2

M

machinery 125:12,16 126:1

made 110:6 164:11 168:11 192:16

main 23:20 124:7 142:17,21 143:5,16

maintain 57:13 84:2

maintenance 123:16

majority 16:21 82:8 164:3

make 6:14 20:9 36:5 39:1 53:1 59:7 79:7 103:1 147:3 152:7 164:13 166:14 175:7 188:5 196:14

makes 94:18 125:22 129:18

manifold 114:21 115:15 116:8

manual 123:11,13, 15,21 124:11 125:3,5 126:22 129:1 130:16 132:20 133:9 137:10 138:2,3,18 140:1 143:12 144:8 146:3, 19 147:1 151:22 152:20 155:18 182:19 204:8,9,22 205:7,17,22 206:7

manufactured 149:14

manufacturers 170:2

Manufacturers' 169:20

marked 70:20,21 74:4,6 106:5, 8,13,14 152:2

mass 43:7, 13,16,18,20 44:2,3,5,7 46:6,11 47:4, 8,16,22 48:8, 14,15,21,22 49:4 52:1,7 121:13,22 122:8,9,12, 16

Massachusetts 5:16

master's 158:21 159:8,15,17

matching 87:12

material 18:15,18 19:3 20:4 38:2,8

matter 8:16 157:12 158:12 162:22 163:17 166:9 172:9,12 185:3 186:16 193:13 202:3

matters 8:12, 14,21,22

maximum 55:2

meaning 9:1

means 33:13 43:14,15 99:3,7,8,19 105:17 108:8 116:2 129:9, 15 160:7 183:2,4

meant 205:12

measure 13:17 14:13 130:11,14

measured 14:11 43:17

measurement 74:18

measurements 14:1,15

mechanic 81:8

mechanical 12:1 23:5,13 125:19 127:4 157:20 161:8,17,19 176:19

mechanics 160:8,12

mechanism 198:13 199:5

meet 22:18, 21 25:1

members 170:6

memorized 180:13

memory 13:9 24:12 31:14 64:17 102:19 145:11 152:6 156:20 180:4

mention 165:18 169:18 176:17

mentioned 15:17 24:7 28:15 32:18 36:20 45:13 46:5 59:4 86:8 175:15

mentions 172:13 173:5

Merchant 23:2

met 5:17 65:5

metal 110:6

methane 30:10,12,13, 16

methods 111:21

middle 141:1, 4,10 146:14 147:9 148:4 150:22 155:5,19

mind 59:14 69:9 70:3 174:15 180:21 181:3 185:12

mine 22:22 23:6

minutes 5:17 51:13 153:12 195:22 203:1

mischaracterization 187:18

misspoke 205:11

mix 90:6

mixed 92:13 93:16

mixer 93:9,11

mixing 93:12, 13 191:5

mixture 85:9 86:20 122:7 191:6

mode 206:16 207:1,2

model 124:18,21,22 133:20,22 182:13

models 10:14 123:17,19,22 124:2,4,8

modifications 192:16

modified 69:10 70:3

modify 206:5

modifying 69:14

molecules 42:3 87:12, 13 120:5

moment 9:13 70:3 74:9

monitor 51:15

monoxide 170:13,15, 17,20 171:2, 5

morning 5:8

Morse 5:2,8, 11 6:6 21:4, 15 22:5 51:21 64:10 71:2 106:4, 17 157:4 196:4 197:9 200:7 201:17 202:2 203:13 204:7

Morse's 20:20 201:20

motion 160:8,10,11 191:8

motivate 20:9 34:3 48:10 153:5, 6 176:12

motivation 43:5 47:15

move 103:10 137:7 197:5

moves 43:18 115:10

moving 42:5 46:1 205:16

mower 131:14 167:9,13,16

mowers 167:20,22 168:3,7,9

multiple 63:20,21 105:3 111:4, 21 149:22 190:2

multiplied 12:12

N

Nakafushi 71:6 73:8 74:12,15,21 75:1,7,11,17, 19 76:2,14, 22 77:7,12 78:3 79:1,5, 6,9,16 81:21 82:18 83:18, 21 84:7,9,12, 14,18 85:12, 13,19 86:6, 22 89:20 90:13 92:2, 16 93:17 94:1 97:4,14, 16 98:9,13 99:2,16 100:7,20 101:7 102:1, 4,13 103:10 104:11,18 135:20 136:3,9,12, 17 137:11, 14,21 153:16

Nakafushi's 85:21 90:9 91:18 93:8 97:5 99:7 100:13 101:19

narrow 190:8

narrowed 190:11

narrower 181:20

narrowing 91:7,10

Natick 5:16

National 166:2

natural 17:15 28:7 30:15 57:5 124:14 165:19 166:12,18 167:16

naturally 57:17

nature 11:2 158:10 162:13

necessarily 35:15 44:1 49:21 55:3 62:6 178:3 187:4

needed 26:5 30:11 101:8 125:14 135:3

needle 112:7, 14

negative 60:3,7 88:1

negatively 77:20

NFPA 165:19 166:11 167:13,21 168:6,12 169:3,4,9,13

nomenclature 114:8,9,10

nongasoline 138:22

nontypical 61:6

normal 61:8, 10 197:16 200:21

note 147:11

number 12:12 13:8 16:2 56:14 76:18 81:17 82:11 110:1 126:15,20 127:13 142:11 155:4 179:4

numeral 93:9,17 99:10 107:14,18 113:1,12,13 134:7 136:22 138:12 182:21 183:9,11

numerals 112:3,5

nut 155:8,9

O

oath 6:17

objection 9:16 10:13 11:5 12:18 13:1,7,13,19 14:19 15:10 16:1,18 17:4, 11 18:1,7 19:1,18 20:17,18 21:10 22:8, 12 25:13 26:21 28:1 29:20 32:6 35:8 37:4,13 38:15 39:12, 20 40:3 41:3, 12 42:12,20 44:13 45:18 46:8 47:10 48:6 49:6 51:1 52:3,12, 19 53:12 54:1 55:19 57:9,19 60:11 61:20 62:5 63:14, 15 65:1,15 66:21 67:5, 14 68:3,13, 21 69:12,21 70:7 71:18 72:18 73:10 76:1,7 77:6, 17 78:19 80:11 81:20 82:5,17 86:4 87:4 88:5 90:17 93:1 94:7,20 95:2, 19 96:11,15, 20 97:2,13, 22 98:5,15, 19 99:17 100:6 101:14,22 102:10,14 103:8 104:10,20 107:9 108:3, 12 109:16 110:12 111:8,17 113:14,18 115:20 116:6,20 117:9 118:1, 5,12,18 119:11,17 120:10,20 121:9,17 123:14 125:4,10 126:9 128:18 130:13,22 132:9,21 133:2,18 134:3,15,22 135:7 136:10 137:6,12,19 138:7,20 139:12 140:15 141:19 142:6,14,22 143:8,19 144:2,6 145:8,15,21 146:12,21 149:9 150:9 152:14 153:20 154:5,19 155:11 156:16 158:22 162:1,8 163:7,22 164:20 165:3 167:10,17 168:4 169:6 171:22 172:10 173:17 174:7 176:7 177:3, 20 180:9 181:1,12,18 182:9 183:17 184:5,12,22 185:16 186:2,8 187:6,16 188:9,21 189:9,16 190:10,17,22 191:13,21 192:9,19 193:4,18 194:10 195:1,13 196:12,20 197:18 198:2,11 199:11,22 200:1,10,19 201:8,16 203:8,16 205:10 206:2,13

occupied 108:9

occur 53:15, 16 57:17 62:4,10 88:1, 3 120:15,18

occurring 42:6 45:3

occurs 38:4 127:2

off-typical 60:14,16

open 83:3,12

96:7 100:18, 20,22 101:1, 5,6,10,11,12, 20 102:2,3 103:12,22 104:7,13 105:10,19 112:16 134:19 144:10 145:2 157:5 178:14

opened 82:19 83:1 104:4 134:16 144:5

opens 92:12 103:16 146:5

operable 63:22 78:13 205:22 206:12 207:1

operate 27:6 28:11 41:1,5, 10 63:11 66:18 78:1,3 100:16 178:4 201:11 202:4,14 203:13,14 206:15

operated 32:2 187:9 190:14,16 200:12,17,18

operates 191:9 204:10 205:1

operating 60:19 61:8, 10 62:3 64:2 76:11 86:13 89:14,18 128:21 189:11 192:3 201:18

operation 61:6 85:14 99:8 105:17 174:17,18 178:17 190:19,21 191:11,14 194:8 197:17 198:8 199:9 200:21 201:4

operational 144:16

operations 52:14

operator 134:19 135:5

opinion 37:1 118:3 184:20 185:1 193:1

opinions 8:18 71:17

opposite 175:1

optimum 85:8

orders 207:8

ordinary 75:6,12,14 76:22 77:10 78:5,8 97:16, 19 111:19 116:22 152:11 183:7,12,21 186:22 193:14 194:3 195:6

organization 166:3 169:2 170:6,10

orientation 128:6

orientations 128:8

original 71:12

originally 53:3

outflow 105:10,11,19

outliers 180:21

output 15:8, 16

over-air-fuel 87:17

overlap 129:22 168:13 172:18

overlean 86:20

overrich 85:1,5,11,17 86:15 87:2,5, 7 88:2,16,21

P

P.E. 5:2

p.m. 207:22

pad 56:21

pages 186:10

paragraph 105:8 140:5 157:14 165:17 169:17 171:11 172:13 173:5 181:5

paragraphs 21:6

parallel 169:3

parsing 168:14

part 22:18 24:4 26:8 34:10 64:10 66:14 92:2 115:5,7 127:1,2 145:16,17 146:6 148:3, 5 150:1,13, 16 151:3 158:1,4 159:14,21 195:2 202:12

particulates 80:2,4,6,8

parties 207:9

parts 24:13 148:16 149:16,17,19 150:3,4 167:1 169:10

pass 160:9

passage 84:17,21 96:8 105:10, 12,20 112:8, 9,10,11,16 155:7

passageway 91:8,10 140:22

passing 115:1

past 43:18,21 171:17

patent 5:19 26:6,13,16 27:1,2,5,11 29:5 63:18 64:7 65:3,10, 17 66:4,12 71:7 72:22 73:2 107:1 157:12 202:8,20 203:1,4,5,7, 12,18

path 44:20 141:2,3,12 148:20 149:1

percent 30:9, 10,11,12,13 31:8,9 35:21 36:19 51:15 192:7

percentage 189:7,10

performance 30:19,22 34:16 128:21

performed 109:15 169:18

performing

162:17,18

period 159:4, 7

permit 199:5

person 75:6, 12,14 76:22 77:9 78:5,8 97:15,19 111:19 116:22 152:11 183:6,12,21 186:22 193:14 194:2 195:6

person's 140:9

personally 51:21 52:4 60:12

perspective 151:4

petroleum 29:7,8 169:14

PGMA 170:1, 12

Ph.d. 5:2 159:16,18 160:3

phase 33:15 34:2,6,13,22 38:4 39:6,10 42:1,4,5,7,10 43:6,9 44:16, 17 45:4,6,9 46:17,19,21, 22 47:4,8,13, 14,16,21 48:9,11 49:11,17,18 50:3,12,16, 21 53:4 54:8 55:9 61:11 62:19 68:16 69:8 70:18 95:4,8 98:21 99:1 120:5,6 154:9 185:9 186:15 187:15,22 188:11,14 189:21 190:5,7 191:16,17 193:10 194:20 195:14,16,17 204:2,14,15

phase-change 32:14 33:12 47:18

phenomenon 160:13

photo 128:5

photograph 149:2

photographs 146:22 147:2

phrase 72:20 88:6 120:1,3 178:10 202:19

physical 14:5 48:1 176:11

physically 14:4 39:17 146:1

physics 50:7 114:1,3 185:5 186:16 188:4 193:13,22 195:5

pick 12:19

piece 65:19 149:15,17,20

pieces 149:22

pipe 16:20 18:11 19:3,6, 9,10,15,16, 21 20:6,8,10 50:9 108:21

pipes 21:12

piping 9:11 15:19 16:3,5, 8,9,14,17 17:2,3,6,10, 14,17 18:6, 15,17,18,22 20:4 51:3 53:19 56:19, 20 57:3 58:12 175:16,18 176:5,10,12, 15 189:18

piston 12:7

place 183:8, 10

places 105:3 188:15

plan 54:5

plant 9:7 34:15

play 192:13

plunger 182:2,15

point 7:15 10:1 21:2 26:12 41:17 42:6 43:18, 21 45:10 50:5 54:16 88:22 103:11 105:13,16 119:15 121:3 126:7 134:20 135:6 153:10 161:2 178:1 197:6

pointed 76:3 155:5

pointing 184:6,7

points 63:21 64:13,21 65:14,21 96:22 119:21 120:6 204:15

pollutants 87:21 89:13

population 82:7

portable 10:6,10,11, 18,19 11:1,4, 8,9 12:14,22 13:5,12 14:18 15:1,3, 5 169:19 170:3

portion 21:5 33:19,20 45:15 105:1, 5 114:2 141:11 148:10,12,15 155:13 165:2 200:3 201:20

portions 92:3,4 148:20 149:6 164:19

position 100:18,21 101:1,5,20 102:12 103:5 104:4 143:7 184:9 185:13

positioning 39:9 103:17

positions 102:8 103:19 165:10

possibility 53:2

potential 95:11 183:19

potentially 95:6 199:16

power 9:7 14:7,8,10,17 15:2,8,15 33:3,4 34:6, 15 92:14 99:18 121:15,19 122:10,11 125:12,13,19 132:10,12 133:4,6 143:6,13,17, 22 144:5,9, 20,21 179:5

powered 144:15 166:12

powers 12:8 34:9

practical 37:9,18 50:4

precise 6:10 8:7 180:5

preferably 114:20

preheated 121:3

preheating 120:22

preparation 22:19 25:18 26:9 163:2

prepare 22:14

prepared 23:16 172:9, 12

preparing 66:8 202:12

presence 77:19 170:8

present 6:22

presenting 5:3

pressure 19:22 34:1 35:11 36:21 37:3,11,12 38:4,6,7,14, 20 40:14,21 50:10,11 56:7 63:6 91:8,9 115:11 121:2,4,7 154:9 171:14 176:21 185:9 195:14 206:18

pressure-regulating 206:17

pressures 57:6

pressurized 37:16 45:21

pretty 45:16

prevent 198:20

prevention 175:6

previous 18:3 32:17 68:22 111:12 148:21

previously 5:21 70:20, 21 74:4,6 106:5,8,12, 14 123:5,6

primarily 32:10 166:22 194:6,7 196:10,11, 18,19 197:4

principle 193:15

principles 21:19 161:17

prior 21:13 22:6,16 23:22 24:1, 13 25:6,9,11, 14,21 26:7 64:14,21 65:5,11,19, 20 66:6,13 123:9 165:11,12,13 177:11 179:11,13 188:17 189:4

problem 19:7 53:20 55:18 59:4,18 62:2, 11 63:3 89:1 175:1

problematic 61:19

problems 62:4,7,8,9 67:2,6,11 68:2,12 69:11 70:5, 11,12 86:22 89:8,10,12 95:12

procedures 156:11

proceeding 22:11

process 6:12 45:7 46:21 55:11 100:12 121:1 127:12 132:12 178:1

processes 32:13 33:11, 15

processing 9:8

product 9:6 182:12 201:11

production 30:6

products 9:4, 10 129:17

professional 27:22 28:5

program 158:21 159:5,8,11, 14

prohibitively 30:13

project 9:22 23:15,19 25:5 48:2 60:12,18 61:9,12 69:1, 6 70:9 158:3, 9,11,14 200:11

projects 9:10,19,21 10:5,9,12,15, 21 15:18,22 16:2,4,7,10, 13,19,21 17:13,16 161:11,18,21 162:3

propane 17:15 28:11, 15,20,21 29:6,9,11,19 30:10,11,12, 17,21 31:1,3, 8,9,18,19 32:1,3 34:3, 18,20 35:10, 14,16,19,22 36:1,2,7,9, 11,13,14,19, 20 37:2 38:11,13,17, 18 39:2,4,5, 6,7,10,14,15, 18,19 40:1,2, 6 41:2,8,9, 10,11,15,16, 18,19,22 42:3,5,7,9, 10,15,18 43:2,8,19,22 44:9,10,11, 15,18,19 45:4,6,13,15, 22 46:4,11, 14,17,22 47:4,6,8,13, 21 48:9,17, 20 49:5,10, 16 50:2,15, 20 51:6,7 52:1,2,6,9, 14,17,20,21, 22 53:1,3,4, 9,10,18,21 54:6,12,19 55:5,9,13 56:5 57:3,5, 8,11,13,18 58:1,7,10,12, 22 59:6,22 60:9,13,19 61:2,4,11,15, 17 62:16,21 63:1,11,12, 19 64:13,20 65:12,20 66:18,19 67:3,4,9,12 68:6,11,12,

15 69:2,3,4, 8,10,15,18, 19 70:4,18 95:7 107:20, 22 153:4 154:7,9,11 169:11,16 184:3,17,21 185:15 188:11,12, 13,14,19 189:3,8,20 190:4,6 191:12,16 192:7,8 193:5,8,9,15 194:17,20 195:16 197:1,9,16 198:1,6,10, 20 199:6,15 200:9,13,18, 22 201:12,14 202:4,7,15, 17 203:14, 15,18,22 204:5,6,11, 13,17,19 205:15 206:10,11

proper 84:4 90:6,21 91:4

properly 84:4

properties 22:1 34:22 37:15,20 47:14 81:8 122:22 176:11

property 8:21 38:3

Protection 166:2

provide 31:13 57:13 59:12 90:20 91:4 92:13 99:18 121:13,22 125:13 133:4 136:4 179:17 203:12

provided 8:20,21 65:4 125:20 152:3 183:2

providing 8:17 120:16, 19 161:7,18 194:13

publications 171:12,16

pull 13:8

pulled 62:18 140:6

pulling 62:19

pump 81:13, 17,18,21 82:3,10 137:1,5,10, 15 138:3,6,8, 9

pure 31:1,3, 19 32:1,2,3 35:15 36:7,8, 12

purely 50:15 51:6 54:7

purity 30:7, 18 36:11

purpose 83:14,15,17, 22 84:6 86:6 90:4,12,19 92:20 93:13 98:14,16 100:3 107:6 109:6,9 110:18 112:14 116:14 125:2 126:5 132:18 133:1,3 134:14 137:4 142:21 154:4,8

purposes 90:16

pursue 159:5

push 12:7 81:22 191:7

pushing 34:17 186:16

put 22:1 49:8 53:13 67:20 106:10 136:7 152:9 164:5, 6 191:20 192:1

Q

Qualifications 157:7

quality 24:4 153:4

quantify 87:8

quantitative 31:14 162:18

question 7:11,18 9:20 21:16 31:22 41:6 63:17 64:9 67:15 68:4,9,15 74:10 79:8 88:14 101:2 102:21 103:3 111:13 149:11 188:17 192:20 196:13 200:4,5 204:21

questions 7:2,8,18,22 76:17 162:21 198:7 202:22 203:3,6,10 207:3

quick 51:10

quicker 46:20

R

range 10:7 11:12 12:21 13:3 14:17 27:17,20 59:9 80:14 125:7,8,14 166:5 179:16 180:3,8 183:18,22 190:8,12 191:15,20 192:2

rate 19:13,16 20:2,14 21:17 43:7, 14,16 44:2,3, 6,7,8 46:6,11 47:4,9,17,22 48:8,14,16, 21,22 49:4, 10 50:2,8,15 52:1,7,22 53:1,6,22 54:19 55:2 56:5,10 57:14,15,16 58:4,20 59:22 60:2, 21 121:13,22 122:8,10,13, 16 199:14

rates 18:10 20:7 21:11 152:17

ratio 84:5 85:1,6,11,18 86:16 87:3,9, 16,17 88:2,4, 16,17,19,21 90:7,21 91:4, 16 93:3,6 122:6,9 178:6,8,14, 15,17 179:11,15,19 180:1 206:20

ratios 179:1, 16 180:4,8, 11,15,19,22

reaches 197:7

read 105:5 114:13 196:14

reading

72:21 75:7 101:7 102:17 111:20 187:1

real 67:18

realtime 207:8

reason 6:19 29:18 30:1 43:12 60:10 169:1 175:9 176:14 203:9

reasonable 119:19

reasoning 71:21 115:8

reasons 29:22 30:2,5, 21 52:10 84:22 85:18 86:6 119:7 120:8

reboil 34:11

recall 9:13 13:20 22:9 52:4 61:12 73:12 119:4 151:16 164:16 165:15 197:12

recalling 49:12

received 159:15

receives 144:5,9

receiving 105:19 144:20 159:16 198:9

recess 51:19 106:2 157:2 196:2

recollection 22:13 66:10 69:6 107:10 119:3 162:11 164:10 165:4,7 180:12

recommend 199:19

recondense 34:10

record 5:10

recording 7:1

refer 35:21 36:1,6 71:6 73:4 89:2 113:9 120:2 123:21 126:19 178:12 204:16

reference 70:22 71:7 73:9,18 74:7, 15 97:4 106:9,15 107:14 123:12 126:10,13 137:14,15,21 179:17 183:20 185:6 186:1,4,5,7, 11 187:1 188:10,18 189:2,15,17 190:4,16 192:21 193:17,20,21 194:4 196:8, 16 197:2 204:13

references 65:5 66:14 123:10 189:4

referred 36:4 55:15 73:6 89:5 134:7, 11

referring 18:3 31:19 35:14 36:16 37:20,21,22 41:7 52:15 99:13 105:6 114:14 123:20 125:17 134:6 139:6 147:2, 6 171:16,20, 21 189:5

refers 12:9 17:21 29:6 57:11 63:19 72:22 88:16 92:3 107:18 109:4 113:1, 2,6 128:6 129:14 132:1 172:20 182:21 203:18

refresh 64:16 102:19 145:11 152:6 156:20

refreshing 24:12

refrigerant 32:16 33:18 34:4

refrigeration 33:18,19,22

regret 159:18

regular 207:14

regularly 52:13 166:9

regulation 167:9,15

regulations 9:1

regulator 62:22 63:2,5 199:4,10,14

regulatory 16:13

relate 9:4 171:6,12 197:10

related 15:18 16:10 157:11 203:5,7,11

relates 5:19 26:16 63:17 72:12 178:6, 9 200:4

relative 39:9 171:4 179:21

relevance 9:16 10:13 12:18 13:1,7 14:19 15:10 16:1,18 17:4, 12 18:8 19:2, 19 20:18 22:8,12 29:21 32:6 37:4 40:3 42:21 47:11 52:3,12,19 69:13 70:8 73:11 80:12 98:6 108:13 109:17 111:18 163:8 164:1 167:18 168:5 169:7 173:18 178:16 182:10

relevant 14:5 15:15 21:13 64:6 65:12, 20 66:5 78:10,12 115:4 140:16 147:7,10 157:11 171:10 186:10,11 202:2 203:3

relied 25:15 71:16 166:9

relies 27:19 34:5 51:22 91:6

rely 25:12 33:15 169:11 177:10,17

relying 34:12 57:1 174:20

remain 144:10

remember 9:17,22 10:7,

11,14 24:11, 17 117:11 120:14 156:17 162:9

remind 129:10 135:14 167:12

removed 146:2 149:8 206:9,17

repeat 101:2 102:20 196:13

rephrase 7:12 204:21

report 123:10 163:2,16,19 164:2,4,5,7, 9,11,16,19, 21 165:2,5, 10,18

reporter 6:22 7:16 207:7, 13,17

reports 163:13

represent 5:18 199:18

reproduction 147:4,17

require 46:6, 11 48:20 49:4

required 48:22 178:3

requires 125:19

research 158:6 160:3 169:18 170:9 171:6

residence 17:14,17

residences 16:6

residential 32:22 35:11 38:16 39:7, 22 40:20 41:1,7,8,14, 20 42:14 61:14 197:10,15 199:13

residentially 36:17

resides 77:14

residual 86:14

resolve 84:9, 12

respect 85:11 135:20 137:15 149:7 153:16 163:5

respond 7:2

responsibilities 168:18

rest 85:21 115:8 151:5

restate 21:15 41:6 68:9 111:12

result 19:21 63:1 85:10 86:20 115:12

results 85:17 91:8

review 25:9, 11,17 26:1 71:12 73:18 74:9 102:15 120:13 139:21,22 156:19 166:14 167:11 207:5

reviewed 22:16 23:21 24:2 25:6,14 26:5,8,13 65:3 164:2,4, 12,15

reviewing 79:6 111:2 161:15

rich 85:9 87:16,18 88:10,13 206:21

riding 167:8, 13

risk 170:13 171:4

road 5:15 167:6

role 23:18 161:5 163:4

roles 23:20 25:4 166:13

rotary 191:8

rotated 151:4

rotation 133:7

rough 207:9, 10,12

Roughly 6:9 8:6 24:18

route 140:13

run 6:15 28:6,8 31:17, 22 54:20 55:17 69:1 82:7 87:20 89:16 123:17 124:13 135:8 192:10 193:12

running 41:18 89:15 93:5 140:20 203:21 204:5,6

runs 141:1 200:8 204:17

S

safe 166:17 169:15

Safely 156:8

safety 16:14 156:13,15 165:18 166:4 170:21 171:13 198:12 199:18

saturation 37:21,22 38:2,5,19

save 124:10 135:15

scale 31:6

scenario 44:15 45:19 54:22 61:1 201:18

scenarios 35:1

schematic 97:6,8

science 159:15

scientific 31:14

scope 20:18, 21,22 63:15 66:21 67:5, 14 68:3,13 69:13 70:8 111:18 166:22 168:11,13, 14,16,17,20 170:9 200:1 201:17

scratch 19:13

seats 142:1

section 114:15 116:10 157:6,10 189:6

sections 164:11,13,17 186:12

secure 110:5

select 143:3,

17,21

selected 105:18

selecting 19:15 127:12

selection 18:22 79:11, 17 152:16 153:2

selectively 73:1,3

send 195:15

sending 191:5

senior 158:9, 11,14

sense 14:20, 22 21:8 176:15 179:7,10 180:18

separate 27:2,4 90:3 129:5,16 145:19 146:10 159:12,13 167:14,15

separated 147:16

series 7:18

served 22:10

servicing 123:16

shaft 12:8 127:4

sheet 126:14 127:5 179:18

shop 146:3 147:1 155:17

short 106:1 116:10 195:21

show 147:1 149:4 151:1

showing 150:20,22

shown 100:20 126:12 139:14,16 149:11 187:8

shows 33:7 81:16 108:20 140:6 142:8 145:5

shut 135:2,5

shutoff 144:12 145:1

sic 59:22 150:16

side 75:8,9 105:16 106:10 140:18

sign 207:6

signal 101:8 105:19

significant 21:5 199:6, 18

significantly 37:8 44:5

silver 147:13 155:22

similar 28:9 31:4,5,9 92:17 96:12 124:1 135:21 137:22

similarities 124:2 163:9

single 180:16

sit 9:18 10:8 13:3 28:14 31:15 48:3 49:13 61:13 67:21 70:11 73:12 74:14 101:7,11 117:13 119:4 120:14 126:7 151:16 156:17 165:16 170:7 180:5 181:3 182:11

sitting 13:10 14:16 67:10 95:17 200:22

situated 39:18

situation 44:2 48:7 54:17 55:15 62:15 78:7 88:10 192:18 194:5 197:22 199:21 201:6

situations 34:17 54:11 82:22

size 11:17,19 12:20 13:17 14:2 18:11 19:16 20:10 38:17 40:9 74:18 75:10, 18 130:11,15

sized 54:5 91:13

sizes 12:21 20:6 40:12 75:16

sizing 138:9

skill 75:6,12, 14 76:22 77:10 78:5,8 97:16,19 111:19 116:22 152:11 183:7,12,21 186:22 193:14 194:3 195:6

slightest 159:19

small 15:1 130:21 131:5,13

smaller 11:9, 10,11 15:5 75:8

smoothly 6:15

software 11:22

solanoid 148:6

solenoid 104:3 141:20,21,22 142:4,10 143:3,7,22 144:1,11,12, 17,18 145:1, 5,12 146:2,4 148:1,4,11, 13,19,21 149:6 151:2 181:6,10,16, 19 182:1,4,5, 7,13,15,16

solenoids 144:4

solution 55:18 56:8 58:16 59:4, 19,21

solves 87:1

sort 16:16 40:17 60:14 78:6,17 79:3 109:14 155:1,20 175:11

sound 7:20

sounds 7:21 13:21 153:16

source 57:2, 12 68:1,2,5, 7,11 69:4,5 203:22

sources 60:22

space 42:15, 18 43:3 108:5,6,8

speak 23:3,8, 11 24:15 71:14 188:22

Champion - EX2127, Page 235 of 242
Generac Power Systems, Inc. v. Champion Power Equip., Inc.
IPR2025-01271

speaking 26:6 27:17 29:11 31:10 39:17 40:19 44:4 48:14 77:9,18 90:15,19 119:6 125:11 157:13 171:12

spec 126:14 179:18

special 33:7

specific 10:14 13:3, 21 20:12 22:3 29:17 30:8 43:5 48:2 49:12, 15,19 51:4,5 55:20 56:1 62:20 66:3, 15,22 67:6,7, 8,17 73:19 74:15 75:2,4, 10,18 77:7 78:3,21 79:10,22 80:7 81:10 84:2 91:1 98:7 107:11 111:3,9 113:6 122:17 125:6 126:4, 7 130:8 136:7,13,19 137:14 152:12 154:9 162:17 169:1 171:9 172:2, 20,22 173:20 174:10 176:14 179:14 182:6,12 189:11,13,18 190:2,13 192:3 198:17

specifically 10:11 24:9, 11,17 36:8 49:3 52:15 58:19 63:19 64:5 68:18 85:13 100:8 117:11 119:3 120:13 127:14 162:9 164:16 172:12 179:18 191:1 198:19

specification 104:22 105:1 113:22 114:3 127:5

specifics 9:18 62:1 136:20 179:9

spent 21:4

spoke 22:22 23:1,10 24:7

spot 111:9 140:10

spots 151:18 193:20

spread 170:16

spring 182:1, 14

spring-plunger 181:7,11,14, 17 182:3,8, 17

stand 29:4

standalone 177:18

standard 24:4 166:14, 15 168:9,15, 16,17,20 169:4,9 172:8 200:9 207:15

standards 161:15 165:18 166:4,6,8 167:19,21 168:2,12,18 169:2,11

standpoint 30:6 175:7

stands 158:17

star 151:22 152:2

start 7:5 27:4 89:17 93:4 100:12 129:8 143:10 149:18 150:2 156:7,12,13, 15

started 8:1 93:3 158:21 160:22 162:12

starter 132:5

starters 186:13

starting 87:18 93:7 105:4,7 106:17 114:11 131:18,20 132:1,4,5

state 5:9 171:11 193:2,5 194:17

states 80:19 128:22 129:1 130:16 166:7 169:16 181:5 185:7 195:7 205:17

steam 34:7,8, 9,10

STEMLER 9:16 10:13 11:5 12:18 13:1,7,13,19 14:19 15:10 16:1,18 17:4, 11 18:1,7 19:1,18 20:17 21:10 22:8,12 25:13 26:21 28:1 29:20 32:6 35:8 37:4,13 38:15 39:12, 20 40:3 41:3, 12 42:12,20 44:13 45:18 46:8 47:10 48:6 49:6 51:1,9,14 52:3,12,19 53:12 54:1 55:19 57:9, 19 60:11 61:20 62:5 63:14 64:4 65:1,15 66:21 67:5, 14 68:3,13, 21 69:12,21 70:7 71:18 72:18 73:10 76:1,7 77:6, 17 78:19 80:11 81:20 82:5,17 86:4 87:4 88:5 90:17 93:1 94:7,20 95:2, 19 96:11,15, 20 97:2,13, 22 98:5,15, 19 99:17 100:6 101:14,22 102:10,14 103:8 104:10,20 106:7 107:9 108:3,12 109:16 110:12 111:8,17 113:14,18 115:20 116:6,20 117:9 118:1, 5,12,18 119:11,17 120:10,20 121:9,17 123:14

125:4,10 126:9 128:18 130:13,22 132:9,21 133:2,18 134:3,15,22 135:7 136:10 137:6,12,19 138:7,20 139:12 140:15 141:19 142:6,14,22 143:8,19 144:2,6 145:8,15,21 146:12,21 149:9 150:9 152:14 153:8,13,20 154:5,19 155:11 156:16 157:1 158:22 162:1,8 163:7,22 164:20 165:3 167:10,17 168:4 169:6 171:22 172:10 173:17 174:7 176:7 177:3, 20 180:9 181:1,12,18 182:9 183:17 184:5,12,22 185:16 186:2,8 187:6,16 188:9,21 189:9,16 190:10,17,22 191:13,21 192:9,19 193:4,18 194:10 195:1,13 196:1,12,20 197:18 198:2,11 199:11,22 200:10,19 201:8,16 203:8,16 205:10 206:2,13 207:5,12,20

step 15:17 22:5

stoichiometric 87:10,11 88:17,20 89:4

stopped 132:2

store 37:15

stored 35:6, 9,10 36:20, 22 37:2,8,10 38:13,19 40:2,6,9,10, 13,15,18,21 123:1 185:7 195:7 203:19 205:4,18

stores 41:15

straightforward 49:13

stream 177:11

strictly 26:6

strike 152:22 178:2

structural 15:7 150:7

structure 96:1 108:21 118:4,7,10, 14 134:11 135:11 145:18,19 146:9 151:15,18,20 152:10 153:22 155:1,9 160:4,5,8,9, 10,11

structures 141:14,18 146:10 150:13 187:4

studies 170:14

subcategory 32:17

subcomponents 91:19

subject 21:9 157:12 158:12

submit 162:7

submitted 5:21 202:9

subsequently 115:18

substance 196:6

sucked 105:21

suction 91:11

suctioning 84:15,19

sufficient 97:12

sufficiently 87:18 89:15 193:6

suggesting 69:14

suitable 27:14 114:16 129:21 174:4,11,13, 14 176:5

suite 123:16, 19 124:2

summary 124:16

supply 11:11 54:18 84:4 101:9 105:17 109:5,6,11 110:20,22 113:2,15 114:17,20 154:8

support 161:22 162:14

supported 188:3

suppose 45:4 50:5

supposed 20:22

switch 86:17 96:22 99:8, 21 100:4,5,8, 10,13,15,17, 20,22 101:5, 10,12,19 102:2,5,9 103:4,10,18 105:14,15 142:17,21 143:3,5,16, 17,21 156:13,15

switched 100:11 105:15

switches 142:12,15

switching 85:1,3,14,22 86:9,21 96:22 99:3,7, 18 102:5,9 103:4,18 105:14,15

sworn 5:3

system 18:17 24:5 44:10 52:20 57:11 58:3,11 59:1, 22 60:19 61:19 64:21 65:14,22 66:7 67:1,9 68:17 69:7,9 70:2 82:9 95:14,15,18 102:13 107:2 117:22 119:15 131:18,20,21 132:1,4,7,19

133:10 134:20 135:6 136:9 137:11 152:10 171:15,19 172:17 173:1,4,15, 16,21 174:3, 5,6,20,21 175:2 176:10,13,15 183:15 188:6 192:6

systems 16:15,17 29:6 64:14 125:13 161:16 165:19 171:13 172:1,2,15 173:1,9,12, 13 174:1 175:16,18 176:5 179:12 188:17,19,22 197:10,11

T

takes 140:14

taking 15:17 22:5 195:4

talk 7:6 24:9, 18 119:4 157:15 191:1 204:4

talked 47:14 74:17 86:16 89:20 107:20 153:15 197:9

talking 9:15 21:6,21 27:10 31:6, 12 36:8,12 59:13 66:3 68:18 81:15 136:6 141:6 146:13 178:21 197:19 202:6 204:2

talks 85:13, 19

tank 36:2 38:11,12 39:19 42:16, 19 43:3,11, 20 44:11,16, 22 45:14,21 46:15,16 52:6,10,18, 21 53:9,10, 21 54:6 55:5 56:19,21 57:18 58:1,7, 10,12,22 60:9,14 61:2, 4,12,16,18 63:12 66:19 67:4,13 69:8, 11,16,18,19 70:5,18 75:21 76:4,6, 8,12,15 77:3, 14 81:22 82:3 107:19, 22 108:4,8 109:10,12, 19,22 110:3, 8,11 112:19 113:2,5 114:16,18 119:16 123:1,2 134:7,10 137:7 138:22 151:7,11 182:21 183:2,8,11, 15 184:2,11, 18 185:2,8,9, 22 186:15,20 187:10,15 188:12,13,20 189:6,19 191:17 192:15 193:8 194:7 195:8, 15,17 196:10,18 197:2,3,6,16 198:1,4,6,10, 13 200:9,13, 18,22 201:5, 7,12,14,19 205:4,8,16, 19

tanks 40:9,12 107:20 108:1 183:13,19 184:1 189:3

tasks 162:20

Taylor 106:6

teaches 195:10 205:7

teachings 193:2

technical 162:21

tells 104:18 105:1

temperature 34:1,14 38:3, 6,7 193:3,12 194:15

temperatures 33:21 37:17 57:6 60:20 171:3,4

ten 153:11 203:1

ten-minute 51:18

term 88:9 89:2 178:5 181:19

terminal 144:19

terminates 138:17 140:8

terminology 36:6 202:18

terms 31:9 43:17 55:6 172:18,19

tested 159:17

testified 8:14 9:3,21 13:16 31:16 35:2 68:19 88:15 191:19

testify 6:3

testifying 10:2

testimony 6:20 7:1 8:20,21 20:21 21:1 188:6 192:5 195:9 196:6

testing 162:18

text 185:17 187:13,20 188:2,3

therethrough 115:1

thermal 171:13

thesis 158:1, 5,8 159:21 160:2

thing 20:7 54:2 141:7 172:20 201:13

things 6:13, 14 9:5 10:3,7 11:6 54:4 88:1,3 97:9 122:18,20 129:5 141:8 147:20 159:1 161:11 166:5 167:5,7 168:20 170:11 175:12

thinking 9:18 17:9 18:10 33:17 57:22 58:13 59:14 60:18 62:11 70:10,14 82:6 175:5 176:21 200:13

third-party 152:8

thought 26:14 102:18 203:4

thread 147:19

threaded 110:7,8 112:1 114:21 147:21 149:13

threads 155:22

three-month 159:6

throttle 92:10,11

throw 63:5 174:17

time 14:10 43:18 45:2 62:16,18,19 63:21 67:18 103:1 124:10 135:15 159:4,6 160:15 161:2,6,22 162:2 163:2, 11 171:14 189:1 207:4

times 6:9,11 8:4 120:2,12

Timothy 5:2, 11

title 72:7 107:2 161:6

today 6:3,15, 20 13:10 14:16 26:9, 12 28:14 66:8,9 67:10 74:17 95:17 120:13 126:7 156:18 165:16 179:12 196:5 197:11 203:10 207:4

today's 22:14 25:2,18

told 24:21

tolerate 54:13

Tom 5:18

tools 158:15, 16

top 39:18 41:21 42:9 61:15 69:18 133:10 150:21 151:1 154:22 155:2

topic 20:19 64:6 160:3

total 11:20 130:9,14 131:12

tough 147:17

trade 12:2

trade-offs 130:6 170:21

transcribed 60:5

transcript 207:6,8

transfer 46:20 47:6 48:1 51:3 52:13 55:13 57:2 115:14 116:17,19 129:11 172:14,17,22

transferred 172:21

transferring 46:13

translated 72:2 102:22

translation 71:10,16

transmission 16:9

transmitted 185:14

traveling 173:2

trickier 102:17

tricky 102:21

true 44:8,9 46:9 48:5 62:6 90:8 104:14 108:1 121:16 143:14 185:19 188:16,18 189:2 194:2

truthful 6:20

tube 44:16 46:2 70:17 108:20 113:15,20 114:17,20 115:2,6,11, 18,22 116:1, 3,4,7

tubing 116:10 189:18

turbine 34:6, 8,9,17

turn 75:19 123:4 126:10 127:4 133:8 151:6 154:15 156:6 165:17 172:4 181:4 182:19 197:22 204:7

turnaround 207:16

turned 100:15 105:18 143:16

turning 110:9 132:11 140:12 196:8

two-cycle 129:18,20 130:5,7

two-phase 173:13 175:20,21

type 18:6 78:9,12 80:3 127:17 129:2 132:7 138:1 152:12 161:9,14 174:12 177:4,14 183:8,14

types 8:9,11 9:3,14,19 10:22 11:2 16:5 27:8 28:3 32:19 77:4 79:14 80:8,9 89:12 112:2 128:8, 12 153:5,7 166:21 167:2,4 173:19 174:10 180:20 183:22

typical 13:11, 14 14:14,18 15:1 38:16 39:7,21,22 40:22 41:14, 20 55:21 57:6 80:1,6, 13 84:10,12 87:8 180:3,8, 11,15,17 197:14,15,21 199:1,12

typically 11:9 12:14 17:15, 17 35:6 38:18 44:12 57:11 80:9 89:5,17 108:4 110:4 172:20 176:21 177:9,13 179:5 181:6, 13 182:5,16 199:4

typing 164:3

U

U.S. 5:19 80:19

U.s.-based 166:3 170:4, 6

ultimately 44:18

unclear 138:16

under-rich 88:4,6

undergraduate 158:7

underneath 36:2 38:11 155:9

understand 6:2,16 7:3,11 9:20 43:13 77:1 107:6 123:21 134:18 139:4 149:10,19 151:20 171:4 183:7,14 186:22 187:1 192:20 202:18

understanding 14:17 26:20 32:4,8 37:2,6 38:12 39:1 47:20 48:4 64:1,2 71:5 72:12,21 73:16 74:11, 20 75:13 76:5,13 81:18 82:15 91:22 92:8 93:10,20 96:5 99:6,12, 15 103:2 106:18,21 107:17 109:3 111:6,15 112:5,22 113:13,21 114:4 115:17 117:1,4,14, 17,20 118:9 119:9,14 120:7 123:7 124:7 125:1, 8 126:12 127:9,11 135:4 141:17 142:20 144:22 145:7 151:14 168:15 180:7,10,14 185:12 186:7 189:5 190:18,20 191:10 195:9 196:9,17,22

understood 26:11 53:7 203:9

undesirable 122:13

unexpected 61:7

unheard 61:7

unintentional 55:3 60:2

unintentionally 53:20 54:3

Union 157:21 158:14

unit 43:18

unitary 149:14,17, 20,22 150:4

United 166:7 169:16

units 14:11, 14

University 158:7

unseats 142:2

upper 50:4 150:19

upright 200:22 201:5,12

upside 198:1 201:7,19

upstream 177:12,14

usable 176:16

usage 54:10, 17 55:2 60:15,16

utility 16:8 167:5

V

values 192:2

valve 82:12, 16,19 83:1,3, 9,12 84:14, 19 85:19,20 86:7,12 87:1 89:19 90:3 92:11,12,17 96:2,6,9,16, 17 97:20,21 98:3,4 101:1, 3,6,9,10,13, 20 102:2 103:6,7,12, 13,15,16,21, 22 104:12, 14,16 105:2, 9,12,18 112:7,14 134:16,20 141:20,22 142:1,10 143:9,10,11, 13,14 144:8, 9,10,12 145:1 146:5 148:21 171:14 173:15 174:2,3,16 175:10,13 181:10,16,19 182:4,5,13, 15,16

valves 92:10 104:3,7 142:9 143:4, 7 144:18 173:6,8,11, 20,22 174:4, 9 181:6,21 182:7

vapor 42:15 45:1 46:20 48:9,12 49:18 51:7 53:4 54:8 55:9 95:7 108:2,5,11, 16 116:3 154:7,9 184:18 185:2,20,21 186:20 187:9,11,22 188:8,11,14 189:8,21 190:5,7 191:16 192:14 193:10 194:20 195:17 197:3,5,7 204:15 205:15

vaporization 37:14,19 45:9 46:3 53:1,6,22 55:10,12 56:6,11 57:5, 14,16,17,22 58:2,5,14,20, 21 59:22 60:2,21 63:4 115:12,16 186:18

vaporize 62:17,21 98:16,17

vaporized 44:12 53:10

vaporizer 57:7,10,21 58:18 59:3,8, 20 98:9,14,

21 154:1,4,7, 8,12 184:8, 19 185:3,8, 19,21,22 186:21 187:10,14,20 188:13 189:7 191:18 192:15 193:8 194:6,9,12, 13,18,21 195:8,11,18 197:8 205:9, 16,19 206:1, 5,6,9,16

vaporizes 115:19,22

vaporizing 42:3 44:20 45:16 54:14 62:17 98:22

variable 189:14

variations 11:12

varies 13:15 56:3

varieties 174:9

variety 8:11

vary 14:21 39:16

vehicle 11:18 33:3 131:13

vehicles 9:12 166:12,18, 19,20,21 167:1,3,4,5 168:2 169:5, 10

vehicular 165:19

Venturi 91:7, 14 92:2,3

verbally 7:2

verbatim 205:18

versa 99:9 194:7

version 71:20,22 72:2

versus 11:4 18:12 21:11, 12,21 31:1 39:14 65:7 130:1 171:5 178:13 189:8,21 190:5 191:16 193:10 194:16 204:5

vertical 127:21 128:3,9

vertically 141:1 155:20

vessel 40:14, 21

vice 99:9 194:7

view 139:16 141:11

visible 148:21

volume 12:9 37:7 44:8 163:13 178:12

volumes 178:14

W

wanted 36:6 43:7 151:20

water 17:17 34:8,11,12, 19 80:2,4,6 95:10,11 129:9,10

water-cooled 127:21 129:2,3,6,8

ways 35:9 40:2,5,18 42:14 50:14 56:15,16 78:4 110:2 111:4

week 24:16

weight 18:17

WG 134:4

WG972 124:12 133:21

WG972-E2 124:6

wheel 10:20

wheels 10:20

whichever 144:4

whole-house 10:17

wide 27:17 125:14 166:4 190:12 191:15 192:2

window 61:8, 10

wired 144:19

wiring 142:5

wisdom 168:8

withdraw 200:5

withdrawal 45:20

Worcester 5:15

word 18:2 35:13 36:14 54:3 72:19 81:17 104:5 152:1 163:21 164:2

words 13:21 164:4,5,6 185:4 195:4 205:20

work 5:12,14 14:10 17:13, 16 21:13 24:5 36:15 45:7 59:17 61:22 75:18 84:4 132:7 158:1,3,5,8 159:21 161:2,15 162:12,14,19 163:14 170:12 171:8 172:1 174:21 175:10 194:18,19 197:11 206:14

worked 9:9, 19,22 10:5,9, 15,21 12:15 13:6 15:18 16:2,4,7,13, 19,21 28:6,8, 10,17 48:2 60:8,12 61:9 68:19,22 69:6 70:16 161:11 162:3 200:8,11

working 17:18,20 18:5,19 19:4, 6 20:3,11,15 21:18 22:3 32:12 33:11 34:2,12,18 94:21 95:21, 22 164:9 172:21 173:2 174:22 176:8

works 12:5 41:21 45:8 76:14 91:17 104:22 146:3 191:5

workshop 123:11,13 125:3 126:22 129:1 130:16 132:20 133:9 137:10 138:2,3,18 143:12 144:8 146:19

182:19
204:8,9,22
205:7,17,22
206:7

worldwide
82:7

worth 26:14
30:14,19

wrap 56:19

write 163:21

writing 24:2

Y

years 162:12

Young 23:1,
4,8,11,18
24:9,15,19,
22 163:5,11
164:8,13,18
165:1,9,14

Young's
25:4,12,15