

UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT TRIAL AND APPEAL BOARD

Intelligent Wellhead Systems

Petitioner

v.

Downing Wellhead Equipment, LLC

Patent Owner

Case No. IPR2024-00300
Patent No. 11,560,770

DECLARATION OF DR. ROBERT DURHAM

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I. INTRODUCTION

1. My name is Dr. Robert A. Durham. I make this declaration based upon my own personal knowledge and, if called upon to testify, would testify competently to the matters contained herein.

2. I previously authored and signed a declaration on December 15, 2023, which I understand was submitted to the Patent Trial and Appeal Board of the United States Patent and Trademark Office as Exhibit 1002 in case number IPR2024-00300. I may alternatively refer to that declaration as “Exhibit 1002” or “Petition Declaration” or “First Declaration.” In this Reply Declaration or “Second Declaration,” I incorporate the facts and opinions set forth in my Petition Declaration.

II. EXPERIENCE AND QUALIFICATIONS

3. My experience, qualifications, CV, and consulting rate are set forth in my Petition Declaration.

III. TASK SUMMARY AND MATERIALS REVIEWED

4. My Petition Declaration addresses U.S. Patent No. 11,560,770 (“770 Patent” or “770”). I have been informed that Downing Wellhead Equipment, LLC (“Downing” or “Patent Owner” or “PO”) has submitted a Patent Owner’s Response (Paper 20, “POR”).

5. For purposes of this Reply Declaration, I have been asked to review the POR and accompanying exhibits filed by Downing regarding the '770 Patent. I have been asked to provide an understanding of the technology relevant to the POR. The opinions stated in this declaration are from the perspective of a person of ordinary skill in the art ("POSITA").

IV. LIST OF EXHIBITS

6. In forming my opinions, I have reviewed the Challenged Patent, its prosecution history and references cited by the Examiner, the materials cited in the List of Exhibits, and the materials cited throughout my declaration.

Ex.	Description
1001	U.S. Patent No. 11,560,770 by Jordan Kuehn <i>et al.</i> entitled "Hydraulic Fracturing Plan and Execution of Same" (the "'770 Patent")
1002	Declaration of Dr. Robert Durham
1003	U.S. Patent Publication 2022/0268141 A1 by Andrew Krupa <i>et al.</i> entitled "System and Method for an Automated and Intelligent Frac Pumping" ("Krupa")
1004	U.S. Patent Publication 2019/0233275 A1 by Jared Micheal Carr <i>et al.</i> entitled "Method and Apparatus for Metering Flow during Centralized Well Treatment" (" <i>Carr</i> ")
1005	PCT International Patent Application Publication WO2020/145978 A1 by Beuterbaugh <i>et al.</i> entitled "Simulfrac Pulsed Treatment" (" <i>Beuterbaugh</i> ")

1006	U.S. Patent 8,490,685 B2 by Randy Tolman <i>et al.</i> entitled “Method and Apparatus Associated with Stimulation Treatments for Wells” (“ <i>Tolman</i> ”)
1007	U.S. Patent Publication 2007/0023184 A1 by Robert Jackson <i>et al.</i> entitled “Well Product Recovery Process” (“ <i>Jackson</i> ”)
1008	First Amended Complaint for Patent Infringement, Permanent Injunctive Relief Requested and Demand for Jury Trial, (ECF No. 29); <i>Downing Wellhead Equipment, LLC v. Intelligent Wellhead Systems, Inc., et al.</i> , No. 1:23-cv-01180 (D. Colo.) (“the Litigation”)
1009	Jacobs, Trent. “The Shale Evolution: Zipper Fracture Takes Hold,” <i>J Pet Technol</i> 66 (2014): 60–67. doi: https://doi.org/10.2118/1014-0060-JPT
1010	’770 Prosecution History
1011	Patent Family Priority Diagram
1012	Patent Family Specification Comparisons
1013	’779 Prosecution History
1014	Downing’s Objections and Responses to IWS’s First Set of Interrogatories in the Litigation
1015	Michael Morton, “Unlocking the Earth: A Short History of Hydraulic Fracturing,” <i>GEO ExPro</i> , Vol. 10, No. 6, December 2013 (https://geoexpro.com/unlocking-the-earth-a-short-history-of-hydraulic-fracturing/) (last accessed November 30, 2023)
1016	B.A. Wells and K.L. Wells. “Shooters – A “Fracking” History.” American Oil & Gas Historical Society, (https://aoghs.org/technology/hydraulic-fracturing) (last accessed November 30, 2023)

1017	Carl T. Montgomery and Michael B. Smith, “Hydraulic Fracturing: History of an Enduring Technology,” <i>Journal of Petroleum Technology</i> , Vol. 62, Issue 12 (Dec. 2010).
1018	Bourgoyne, A. T., Jr., K. K. Millheim, M. E. Chenevert and F. S. Young, Jr. (1986). <u>Applied Drilling Engineering</u> , Society of Petroleum Engineers.
1019	Vassiliou, M. S. (2018), <u>Historical dictionary of the petroleum industry</u> , Rowman & Littlefield
1020	U.S. Patent Application Publication No. 2013/0306322 to Sanborn <i>et al.</i> entitled “System and Process for Extracting Oil and Gas by Hydraulic Fracturing” (“ <i>Sanborn</i> ”)
1021	U.S. Patent Publication No. 2012/0255734 to Coli <i>et al.</i> (“ <i>Coli</i> ”) entitled “Mobile, Modular, Electrically Powered System for Use in Fracturing Underground Formations”
1022	Waters, George, Dean, Barry, Downie, Robert, Kerrihard, Ken, Austbo, Lance, and Bruce McPherson. "Simultaneous Hydraulic Fracturing of Adjacent Horizontal Wells in the Woodford Shale." Paper presented at the SPE Hydraulic Fracturing Technology Conference, The Woodlands, Texas, January 2009. doi: https://doi.org/10.2118/119635-MS (“ <i>Waters</i> ”)
1023	Pearson, C.M., Bond, A.J., Eck, M.E., and J.H. Schmidt. "Results of Stress-Oriented and Aligned Perforating in Fracturing Deviated Wells." J Pet Technol 44 (1992): 10–18. doi: https://doi.org/10.2118/22836-PA
1024	Mutalik, P N, and Bob Gibson. "Case History of Sequential and Simultaneous Fracturing of the Barnett Shale in Parker County." Paper presented at the SPE Annual Technical Conference and Exhibition, Denver, Colorado, USA, September 2008. doi: https://doi.org/10.2118/116124-MS (“ <i>Mutalik</i> ”)
1025	Mayerhofer, M. J., Lolon, E. P., Warpinski, N. R., Cipolla, C. L., Walser, D., and C. M. Rightmire. "What is Stimulated Reservoir

	Volume (SRV)?" Paper presented at the SPE Shale Gas Production Conference, Fort Worth, Texas, USA, November 2008. doi: https://doi.org/10.2118/119890-MS ("Mayerhofer")
1026	Roussel, Nicolas P., and Mukul M. Sharma. "Optimizing Fracture Spacing and Sequencing in Horizontal-Well Fracturing." <i>SPE Prod & Oper</i> 26 (2011): 173–184. doi: https://doi.org/10.2118/127986-PA ("Roussel")
1027	K. R. Webster, W. C. Goins, Jr., and S. C. Berry, "A Continuous Multistage Tracing Technique," <i>Journal of Petroleum Technology</i> , vol. 17, no. 06, pp. 619-625, 1965, doi: 10.2118/977-pa. ("Webster")
1028	A. Casero, G. Pace, B. Malone, F. Cantaloube, L. Tealdi, H. Malonga, and R. Seale, "Continuous Pumping, Multistage, Hydraulic Fracturing in Kitina Field, Offshore Congo, West Africa," in <i>SPE International Symposium and Exhibition on Formation Damage Control</i> , 2008, vol. All Days, SPE-112442-MS, doi: 10.2118/112442-ms. [Online]. Available: https://doi.org/10.2118/112442-MS ("Casero")
1029	S. Rassenfoss, "A Look Into What Fractures Really Look Like," <i>Journal of Petroleum Technology</i> , vol. 70, no. 11, pp.28-36, 2018, doi: 10.2118/1118-0028-jpt. at 6 ("Rassenfoss")
1030	R. Oberhofer, "Application of Ball-Drop Technology to Improve Efficiency and Stimulation of Limited Entry Completion Systems," in <i>Abu Dhabi International Petroleum Exhibition & Conference</i> , 2016, vol. Day 2 Tue, November 08, 2016, D021S052R004, doi: 10.2118/183427-ms. [Online]. Available: https://doi.org/10.2118/183427-MS ("Oberhofer")
1031	Tolman, R. C., et al. (2009). <u>Method and Apparatus for Simultaneous Stimulation of Multi-Well Pads</u> . SPE Hydraulic Fracturing Technology Conference ("Tolman Article")
1032	G. R. Holzhausen and R. P. Gooch, "Impedance of Hydraulic Fractures: Its Measurement and Use for Estimating Fracture

	Closure Pressure and Dimensions," in <i>SPE/DOE Low Permeability Gas Reservoirs Symposium</i> , 1985, vol. All Days, SPE-13892-MS, doi: 10.2118/13892-ms. [Online]. Available: https://doi.org/10.2118/13892-MS (“Holzhausen”)
1033	R. W. Paige, L. R. Murray, and J. D. M. Roberts, "Field Application of Hydraulic Impedance Testing for Fracture Measurement," <i>SPE Production & Facilities</i> , vol. 10, no. 01, pp. 7-12, 1995, doi: 10.2118/26525-pa (“Paige”)
1034	L. V. Massaras, A. Dragomir, and D. Chiriac, “Enhanced Fracture Entry Friction Analysis of the Rate Step-Down Test,” in <i>SPE Hydraulic Fracturing Technology Conference</i> , 2007, vol. All Days, SPE-106058-MS, doi: 10.2118/106058-ms. [Online]. Available: https://doi.org/10.2118/106058-MS (“Massaras”)
1035	S. Mondal, "Pressure transients in wellbores: Water hammer effects and implications for fracture diagnostics," 2010 (“Mondal”)
1037-1	<i>Krupa</i> Provisional with filing documents
1037-2	Petitioner’s Notice of Deposition of John Hughett, P.E. Pursuant to 37 C.F.R. § 42
1038	Figure 15 A, frac stack atop BP's D-1 well, Page 47 of Exhibit 2006
1039	Table of Exhibits from Petition
1040	Email to Ms. Terry, from Ms. White, dated June 12, 2023, subject: Expert witness candidate
1041	<i>Deep Fix, LLC v. Marine Well Containment Company LLC</i> , CA. No. 4:18-cv-00848, S.D. Tex. (Feb. 18, 2020), Doc. No. 219, “Findings of Fact and Conclusions of Law.”
1042	Excerpts of Declaration of John Hughett Support of Patent Owner’s Preliminary Response (Exhibit 2006)
1043	Transcript of John P. Hughett, P.E. Deposition

1044	Dr. Robert Durham's Reply Declaration
1045	Signed Errata Sheet from Deposition of Dr. Robert Durham
2001	Wayback Machine - Downing Continuous Pumping Web Page
2002	Downing Continuous Pumping WordPress Page
2003	Tim Marvel Email RE Continuous Pumping Webpage with Attachment
2004	Marvel LinkedIn Post (10.12.2020)
2005	Tim Marvel Declaration ISO POPR
2006	Declaration of John Hughett '770
2007	John Hughett CV
2008	SLB Glossary - zipper manifold
2009	SLB Glossary - missile
2010	SLB Glossary - gate valve
2011	Fig. 5 <i>Carr</i> (annotated)
2012	Hughett POR Declaration '770
2013	Deposition Transcript of Durham
2014	2024 Updated Continuous Pumping Website
2015	Gulf Energy Excellence Awards 2023 Winners
2016	Gulf Energy Excellence Awards 2023 Finalists
2017	Gulf Energy Excellence Awards Nominations 2023 - Wayback Machine

2018	Gulf Energy Excellence Awards Methodology 2023 - Wayback Machine
2019	Downing 2023 Gulf Energy Award Submission
2020	Liberty News
2021	XStimConsulting
2022	XStim Consulting - About Us
2023	XStim Consutling - Operation 1440
2024	Downing - Aaron Dressel - LinkedIn
2025	Occidental Petroleum Q2 2023 Earnings Call
2026	Occidental Petroleum LinkedIn Post
2027	Downing - Addison Kowal - LinkedIn Post
2028	CHESAPEAKE ENERGY CORPORATION REPORTS 2023 SECOND QUARTER RESULTS - Aug 1, 2023
2029	Chesapeake Haynesville LinkedIn Post
2030	Positive Displacement Pumps (archived 8.12.2020)
2031	US20210054727A1
2032	Tim Marvel Declaration ISO POR

7. Other than prosecution histories, Exs. 1010 ('770 Prosecution History) and 1013 ('779 Prosecution History), all citations to exhibits reference original page numbers found in the underlying document, and all emphases are added.

V. LEGAL STANDARDS

8. The Legal Standards provided to me were described in my Petition Declaration. Ex. 1002, § V.

VI. GROUND 3 & 4: ANTICIPATED BY AND/OR OBVIOUS OVER CARR

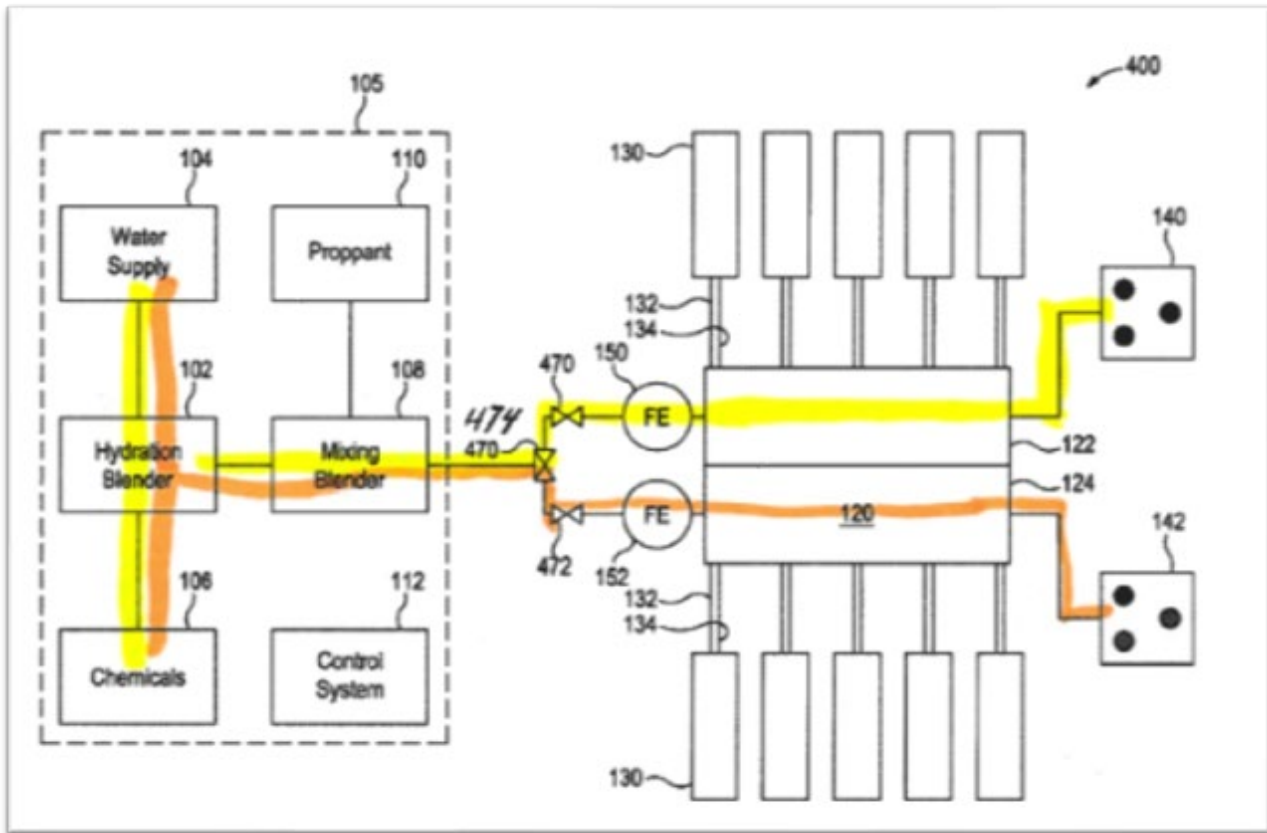
A. OPERATION OF CARR'S SECOND VALVE WILL IMPACT FLOWRATE THROUGH CARR'S FIRST VALVE

9. Patent Owner and Mr. Hughett argue that, in the system of *Carr*, changing the position of the second valve “would have no impact at all on the flow rate in the first isolated manifold path,”¹ and as a result *Carr* does not teach controlling the second valve in response to fluid being communicated via the manifold has satisfied one or more conditions. This is simply incorrect. Initially, this argument flies in the face of logic and the laws of physics. Despite the Patent Owner and Mr. Hughett’s continued reference to the flow paths in *Carr* as “isolated,” they are not. The “isolated flow paths” only occur inside manifold 120. Prior to the fluid entering manifold 120, the flow paths to each well are the same, as shown in the figure that I annotated during my deposition,² and on which the Patent Owner and Mr. Hughett rely, and Mr. Hughett agrees with.³

¹ Ex. 2012, ¶¶ 137, 142; POR, 23, referencing Ex. 2012.

² Ex. 2013, 138:8-155:3; Ex. 2011.

³ Ex. 2012, ¶ 131; POR, 13; Ex. 2013, 138:5-140:5, 140:25-141:24.



Ex. 1004 (*Carr*) Fig. 5 (annotated); Ex. 2011

10. As clearly shown, the paths are the same (pressurized fluid flows through the same equipment) through all fluid components of central well location 105, the piping between central well location 105 and the manifold containing valves 470, 472 and 474, as well as proportioning valve 474 itself. The first law of thermodynamics states that all energy leaving a node in a system must balance with all energy entering the node. If more energy leaves the node, for example by opening valve 472 and increasing flow to well 142, then less energy is available for the other exit of the node, through valve 470 and to well 140. This will manifest itself in a reduction of pressure available at proportioning valve 474 and a reduction of

flowrate through valve 470. *Carr* teaches that control system 112 senses changes in the system and adjusts equipment (valves, pumps, manifolds, blender, etc.) considering the fluid flow targets so, eventually, if enough flow capability is available from the pumps, blenders, etc., flow through valve 470 will recover to the flowrate target, but there will be impact. The laws of physics require it. As a layman's example, nearly everyone at some time has experienced a reduction in pressure, and flowrate in one water outlet (such as a shower or water hose), when a valve to another water outlet (such as a toilet or another hose) is operated. While the system may recover, or the impact may be small, there is always an impact on the first outlet when the valve to the second outlet is adjusted.

11. Mr. Hughett, when asked in his deposition, initially agreed with this analysis but then, under redirect examination by Downing's counsel, contradicted his initial statements by testifying that his first analysis did not apply in the system of *Carr*.⁴ In spite of Mr. Hughett's answers to Downing's attorney's re-direct, the laws of Physics do apply to the system of *Carr*. There will be an impact on the flow rate of the first well (*i.e.*, 470) when the valve going to the second well changes position. The amount and duration of the impact is dependent on many factors, including the size of the change, the configuration of the system, the length of the piping between the centralized well treatment center and the proportioning valve,

⁴ Ex. 1043, 40:17-42:11; compare with 92:17-93:11.

the responsiveness of the controls, etc., but there will be an impact. This is why, as *Carr* teaches and Mr. Hughett agrees, operators (or control systems) at a fracturing site monitor various parameters throughout the fracturing system in order to control the fracturing system.⁵ Thus, as *Carr* teaches, it makes total sense to use information about the system, including the flow rate of individual wells and total flow information, to make decisions about how to control the position of the first and second valves.⁶

12. Ultimately, whether or not operating a valve associated with the second well would impact the flowrate into the first well in *Carr*, *Carr* teaches what it teaches. *Carr* teaches operating *both valves* in light of both the individual *and total* flowrates, and the relationship to *both fluid targets*.⁷ No external arguments can change *Carr*'s clear teachings. It is interesting to note that, according to the Patent Owner and Mr. Hughett, it would be nonsensical to look to a condition of the fluid communicated via the manifold to make decisions on how to operate a second valve, but in the '770 Patent performing such an action is "inventive." Such a conclusion ignores the clear language teachings of *Carr*.

⁵ Ex. 1002, ¶¶ 323-324; Ex. 1043, 22:18-24:6; 29:9-16.

⁶ Ex. 1002, ¶¶ 323-324.

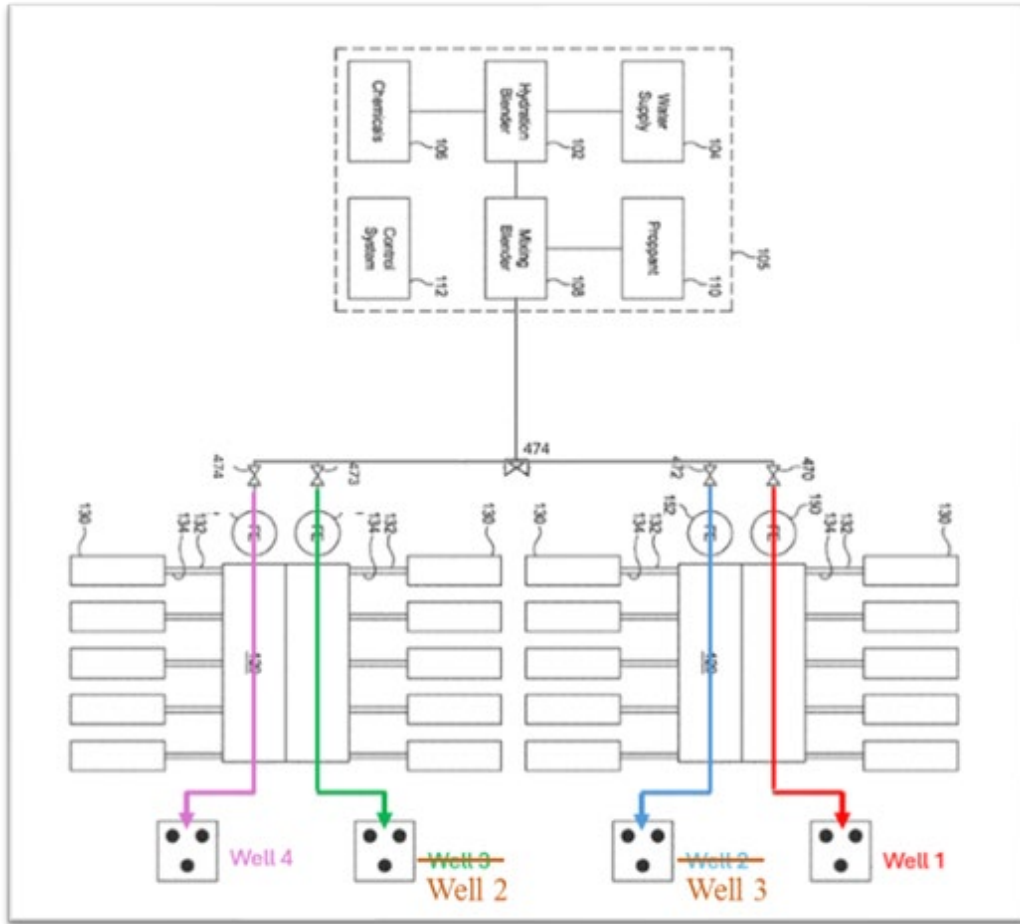
⁷ Ex. 1002, ¶¶ 323-324.

B. CARR RENDERS A FIRST WELL AND THIRD WELL CONNECTED TO THE SAME MANIFOLD OBVIOUS

13. As I discussed in my first declaration, it is my opinion that *Carr* discloses, or at least renders obvious, a multi-well system (wells 1 – 4).⁸ I note that Patent Owner and Mr. Hughett agree that such a multi-well system would have been envisioned by a POSITA based on the teachings of *Carr*, and even provide a strawman sketch of one such system.⁹ I also note that the names of the wells (Well 1, Well 2, etc.) were added to the figure by Patent Owner, and I understand that the names are arbitrary. Although Downing labeled wells connected to a shared manifold, for example, the right-most manifold 120, as “Well 1” and “Well 2,” “Well 2” could just as easily be labeled “Well 3,” in which case wells 1 and 3 would be connected to the same manifold 120.

⁸ Ex. 1002, ¶¶ 335-336, 339-340.

⁹ Ex. 2012, ¶¶ 158-159; POR, 28-29.



Ex. 2012, ¶158 (annotated)

14. As I discussed in my First Declaration, and as *Carr* discloses, manifold 120 contains flow paths to both the wells connected to it.¹⁰ Accordingly, with the wells named as above, both the first well and the third well would be associated with the same manifold.¹¹ As explained with my analysis of the independent claims, the valves associated with each well would likewise be operated in response to determining if fluid communicated via the manifold has satisfied flow targets.

¹⁰ Ex. 1002, ¶¶ 319-321.

¹¹ Ex. 1002, ¶¶ 335-336.

C. PATENT OWNER MISQUOTES OR MISINTERPRETS MY PRIOR TESTIMONY

15. I further note several locations in the POR where Patent Owner misquotes or misinterprets my previous testimony. For example, the Patent Owner attempts to read-in Schlumberger's definition of "zipper manifold" to define the term "zipper valve" as being part of the "zipper manifold" that directs fluid from a "missile" to multiple frac trees.¹² As an initial point, the Patent Owner has not shown that Schlumberger's definition would have been known at the time of '770's priority date. Instead, Patent Owner states that "Both experts agree that this definition of zipper manifold is consistent with the understanding of a POSITA as of May 2021" by quoting a section of my deposition testimony where I make it clear that that is only *one* definition of a zipper manifold.¹³ The Patent Owner and Mr. Hughett compound the error by implying that I testified that a "zipper valve" is one of the "valves that redirect the pressurized fluid flow between multiple wells *on a zipper manifold*."¹⁴ What I actually testified was that a "zipper valve," "[n]o matter its location ... is used to direct fluid flow between the wells,"¹⁵ and that a valve between the zipper manifold and the frac tree is "one example" of a zipper valve.¹⁶

¹² POR, 3; Ex. 2008.

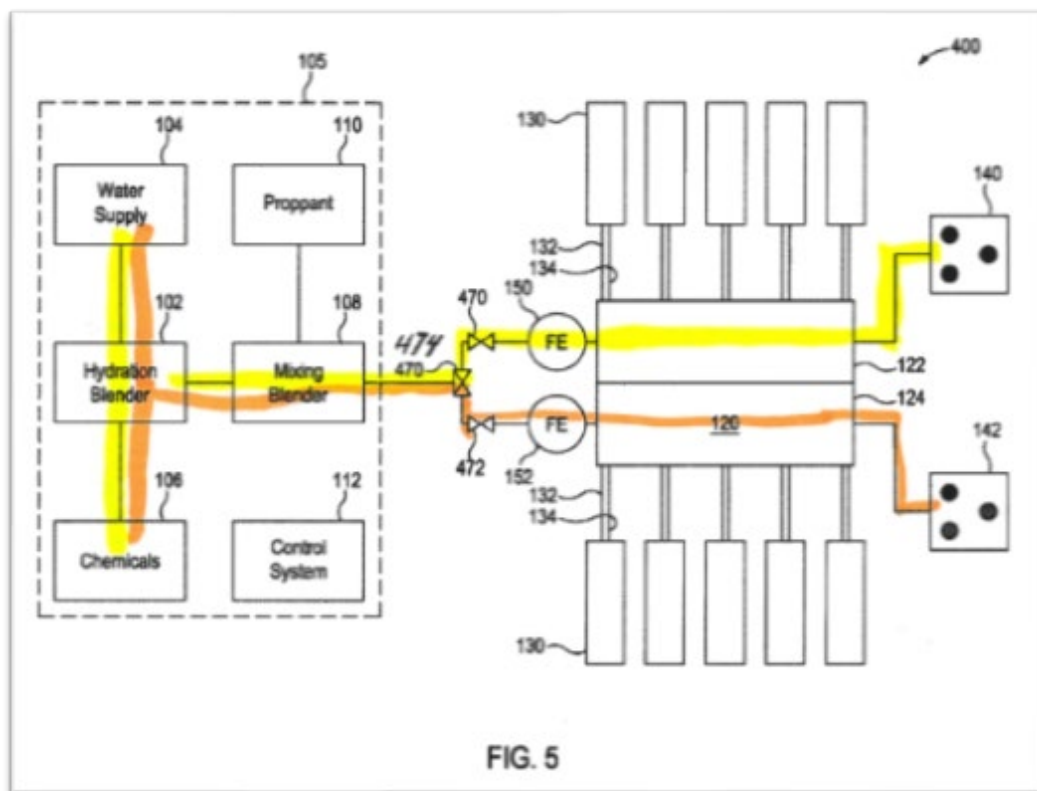
¹³ I note that a zipper manifold is not anywhere in the claims of the '770 Patent; *see also* Ex. 2013, 61:4-63:1.

¹⁴ POR, 6; Ex. 2012, ¶ 107 (emphasis added).

¹⁵ Ex. 2013, 81:7-83:10 (emphasis added).

¹⁶ Ex. 2013, 83:6-10.

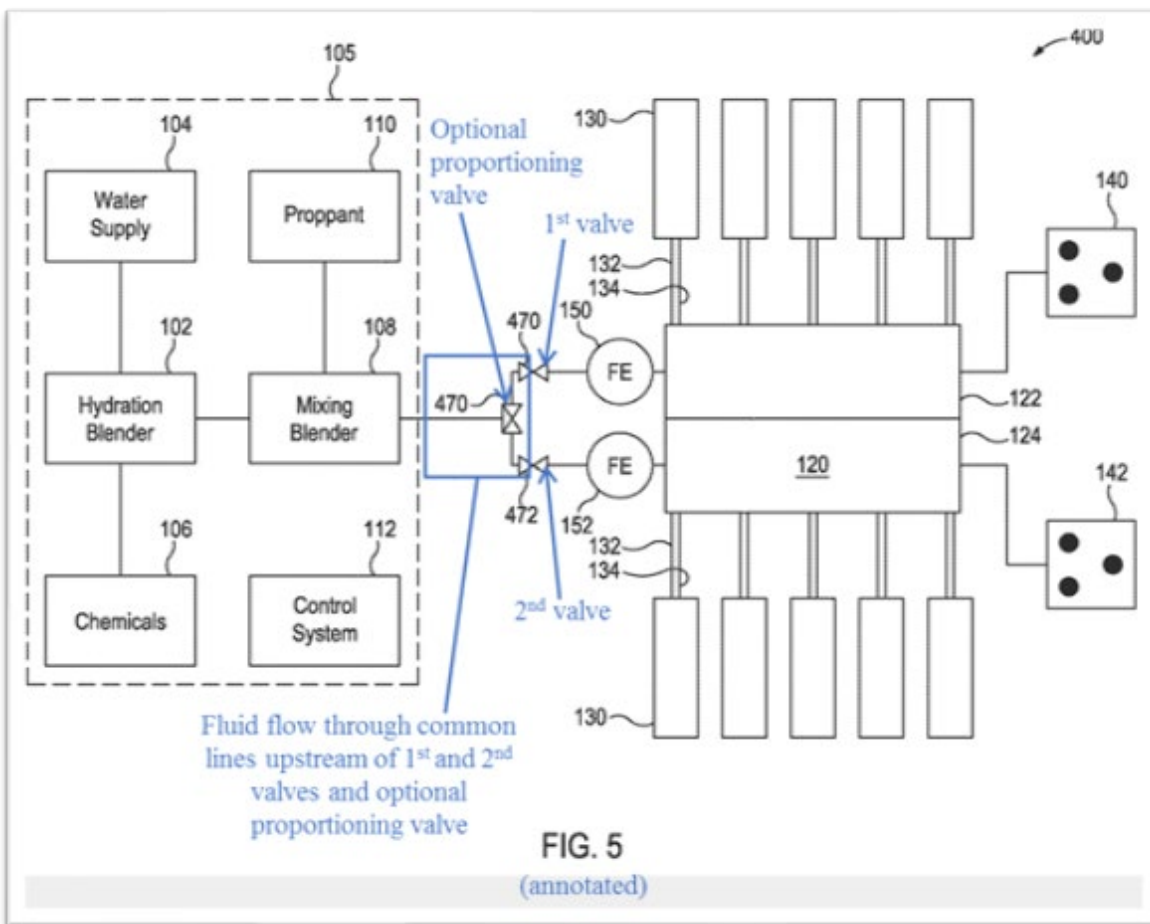
16. Further, the Patent Owner represents that I annotated *Carr* Fig. 5 to show “separate fluid flow paths for first well 140 and second well 142.”¹⁷ This is simply not correct. The annotations on Fig. 5 that I placed show that the flow paths are only separated *downstream* of proportioning valve 474 and valve 470/472. Inside and upstream of the valves, the flow paths are *not* separate, but instead share the same flow path. I testified to this in my deposition, and Downing’s Counsel repeated it, yet this is a section of my deposition testimony that Downing does not reference.¹⁸ This distinction is important when understanding the teachings of *Carr*.



¹⁷ POR, 12-13.

¹⁸ Ex. 2013, 140:25-141:24.

17. In *Carr*'s embodiments without a proportioning valve, or where the proportioning valve is open, closing either the first or second valve 470/472 would redirect the fluid to the other of the first or second valve through the common line between the first and second valves:



18. Further, Patent Owner incorrectly references sections of my testimony in an attempt to support the statement that “because each isolated manifold path is independently pressurized by ‘separate’ pumps and directs fluid to wells with different geologic characteristics, the fluid conditions in each manifold path will be

different.”¹⁹ That was not my testimony. I testified repeatedly that the fluid conditions in each manifold flow path may be the same,²⁰ or they could be different.²¹ “Could be different” is not the same as “will be different,” as the PO claims. Further, Patent Owner claims that I “confirmed” that “[e]ach manifold path’s flow meter separately and independently measures the different fluid conditions to control the respective valves 470 and 472 in light of the wells’ different fluid flow targets.”²² I did testify that the flow meters separately and independently measure fluid conditions, but my testimony does not support the implication that the control of valves 470 and 472 are controlled separately and independently based only on flow in only one of the wells. This is not what *Carr* teaches, as discussed above, and I did not testify that such an implication is in *Carr*. Further, I offered no support for the statement that it is “nonsensical to operate a valve in *Carr*’s second isolated manifold path 124 based on a separate and independent fluid condition in the first isolated manifold path 122,” as Patent Owner appears to suggest.²³ Indeed, as discussed above, *Carr* teaches using total flow information, which includes flowrates into *both* manifold paths to make decisions on how to operate the valves.

¹⁹ POR, 15.

²⁰ Ex. 2013, 94:24-96:4.

²¹ Ex. 2013, 151:21-152:3, 152:19-153:17.

²² POR, 15-16, 20, 23, 26.

²³ POR, 23.

Thus, control of the valves is not “separate and independent” as Patent Owner argues.

19. Further still, the Patent Owner contends that I support the concept that “[o]nce ***unpressurized*** fracturing fluid is split into each of *Carr*’s first and second isolated manifold paths 122, 124, the fluid *does not overlap and cannot be redirected between wells*.”²⁴ I understand that the Patent Owner, by using the term “does not overlap”, intends to say that the fluid to each of the wells does not share any common flowline or flow paths. First, the claims do not require “pressurized” fluids. Second, while I did testify that the fluid does not overlap once the fluid enters the isolated flow paths in manifold 120 in the example shown in Fig. 5, I did *not* testify that the fluid is “unpressurized” because it is not. In any fracturing operation, the fluid entering the intake of the fracturing pumps (and through the isolated flow paths of manifold 120) is pressurized. Although the fluid would typically have a lower pressure at the intake of the pumps than at the discharge, as the purpose of the pumps is to increase the pressure of the fluid, the fluid is still pressurized. This is necessary to facilitate the movement of the fluid through valves 470, 472, and 474 and into the pumps, and to “boost” the fluid to prevent cavitation, as I describe in my first

²⁴ POR, 37-38 (additional emphasis added). Of course, overlapping fluid is not in the claims.

declaration²⁵ and as Mr. Hughett pointed out in his declaration.²⁶ To contend, as the Patent Owner does, that the fluid directed by valves 470, 472 and 474 is unpressurized is to misunderstand the basic operations of pumping and/or fracturing systems.

D. MR. HUGHETT MAKES SEVERAL CRITICAL ERRORS IN HIS DECLARATION.

20. As another example, Mr. Hughett misinterprets the *Tolman Article* (Ex. 1031), contradicts his own testimony, and attributes an incorrect statement to the article that I supplied.²⁷ Mr. Hughett quotes only a couple of words of the *Tolman Article* and ignores the rest.

21. *Tolman Article* states:

Critical to maintaining safety, quality and schedule were proper and sufficient isolation of fracturing fluids. To accomplish this, a minimum of two positive stops or valves were closed during any given isolation from the other wells. The current configuration afforded three valves. These included a minimum of one “ground” valve and two gate valves on each injection head.²⁸

22. Mr. Hughett then goes on to state that this quote means only one well’s valves should be opened at any one time, and that requires closing one well’s valves prior to opening another well’s valves. That is not what the *Tolman Article* says. The

²⁵ Ex. 1002, ¶ 71.

²⁶ Ex. 2012, ¶ 79.

²⁷ Ex. 2012, ¶ 111.

²⁸ Ex. 1031, 4.

Tolman Article simply states that when a well is *isolated* (e.g., shut-in), then two valves in series would be closed (e.g., master valves) instead of just one. This ensures that if one valve leaks or fails, there is a backup. In his deposition, Mr. Hughett testified that this was a common practice in high-pressure pumping generally and on the frac tree specifically.²⁹

23. This quote from the *Tolman Article* makes no reference to closing one well's valves prior to opening another well's valves. In fact, the *Tolman Article*, taken as a whole, makes it clear that multiple well's valves are open at the same time as the *Tolman Article* repeatedly talks about operations in multiple wells taking place at the same time, each of which requires a well's master valves to be open. As one example, Table 1 of the *Tolman Article* shows "simultaneous stimulation operations sequences" on three wells where each of fracturing treatment, wireline ("deploy JITP assembly"), and flowback are occurring in individual wells simultaneously.

²⁹ Ex. 1043, 59:2-60:14.

Sequence	Well No. 1	Well No. 2	Well No. 3
Initial Conditions	JITP assembly in place in the wellbore and ready for 5-stage fracture treatment (Crane 1)	5-stage fracture treatment completed and flowed back. JITP assembly at surface and ready for deployment down the wellbore (Crane 2)	5-stage fracture treatment completed and JITP assembly out of the wellbore. Ready for flowback.
1	First five-stage fracture treatment conducted. JITP assembly removed from the wellbore (Crane 1). ~3 hours	Deploy JITP assembly down the wellbore and set frac plug for 5-stage fracture treatment (Crane 2). ~3 hours	Flowback operations from 5-stage fracture treatment
2	Flowback operations from 5-stage fracture treatment	Second five-stage fracture treatment conducted. JITP assembly removed from the wellbore (Crane 2). ~3 hours	Deploy JITP assembly down the wellbore and set frac plug for 5-stage fracture treatment (Crane 1). ~3 hours
3	Deploy JITP assembly down the wellbore and set frac plug for 5-stage fracture treatment (Crane 2). ~3 hours	Flowback operations from 5-stage fracture treatment.	Third five-stage fracture treatment conducted. JITP assembly removed from the wellbore (Crane 1). ~3 hours

Table 1: Simultaneous stimulation operations sequences

Ex. 1031, Table 1

24. Mr. Hughett confirmed that, for each of these operations, at least both master valves on the frac tree would have been open.³⁰ Accordingly, any characterization by Mr. Hughett that the *Tolman Article*, or that my referencing *Tolman Article*, somehow teaches or suggests closing one well's valves before opening another is incorrect. Mr. Hughett's deposition testimony directly contradicts his analysis of the *Tolman Article* in his declaration.

25. Mr. Hughett then doubles down on his misinterpretation of the *Tolman Article* to argue against the clear and plain reading of the teachings of *Carr*. As the

³⁰ Ex. 1043, 53:21-54:9.

Board recognized in the Institution Decision, *Carr* teaches “the first valve 470 and the second valve 472 can allow for the first well 140 and the second well 142 to each be stimulated individually by opening the respective first valve 470 or the second valve 472 and closing the other valve.”³¹ Despite the clear order of operations in *Carr*’s text, Mr. Hughett somehow concludes that “[i]f a POSITA were to read any ordering into the sentence pointed to by Petitioner, it would be the conventional valve sequencing utilized in the hydraulic fracturing industry when individually and sequentially fracturing two wells.”³² Mr. Hughett attempts to support this with the incorrect statement that the *Tolman Article* teaches this sequence as “critical for safety purposes,” and references the same section of the *Tolman Article* discussed above.³³ The *Tolman Article* provides no support for this improper reading of *Carr*’s teachings.

26. Mr. Hughett also erroneously interprets *Carr* and/or the claims. Specifically, Mr. Hughett states “even if *Carr* could accommodate a four-well system, Petitioner does not explain *how* a POSITA would deploy a four-well system in *Carr*, which necessarily requires four wells, each having its own isolated manifold path, flow meter(s), valve(s), and pump array, but combined into a single integrated

³¹ ID, 16; Ex. 1004, [0033].

³² Ex. 2012, ¶ 148.

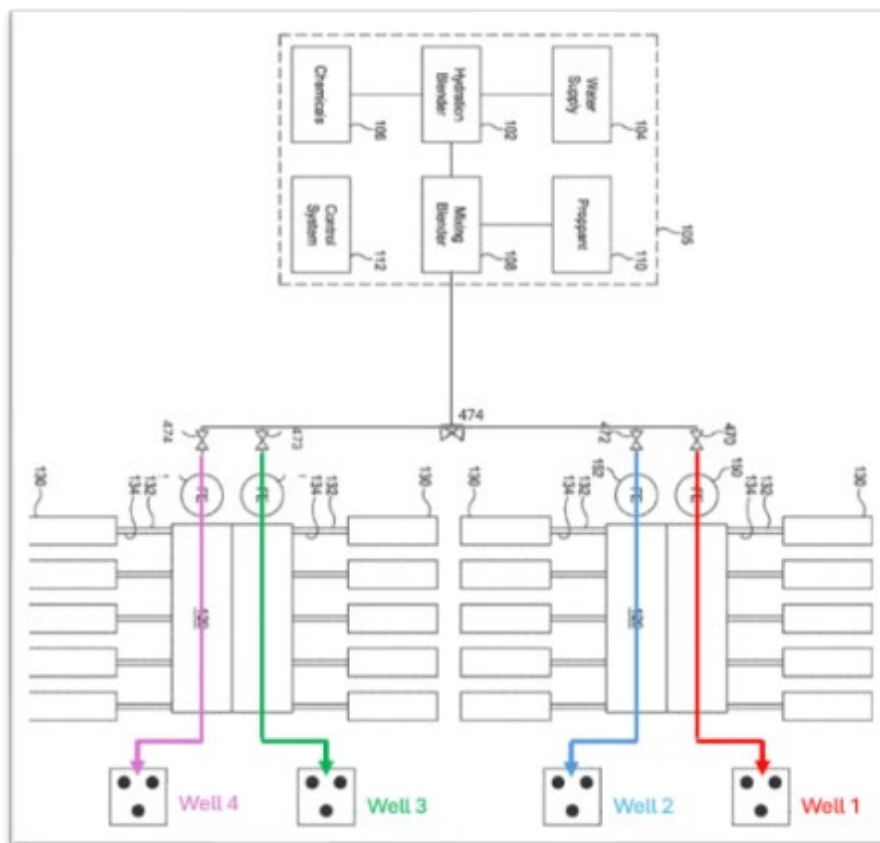
³³ Ex. 2012, ¶ 148.

manifold 120.”³⁴ This is simply incorrect. I address how a POSITA would deploy a multi-well system in my first declaration.³⁵ Petitioner similarly describes that application of *Carr*’s teaching to third and fourth wells and associated third and fourth valves in a multi-well system would have involved performing the same function in the same manner with predictable results, and references my declaration for support.³⁶ Mr. Hughett clearly could envision such a configuration (as a POSITA would), because he creates a figure showing the configuration, which is duplicated below.

³⁴ Ex. 2012, ¶ 157.

³⁵ Ex. 1002, ¶¶ 335-345.

³⁶ Pet., 53.



27. Mr. Hughett then goes on to say, without any support, that such a configuration “would be physically impractical if not impossible given the space needed to accommodate four sets of pump arrays.”³⁷ It is unclear what assumptions Mr. Hughett has made in coming to this incorrect conclusion. Perhaps Mr. Hughett has in mind a single well pad of certain dimensions in a certain part of the country. Regardless of what assumptions he has made, those assumptions or limitations are not contained anywhere in *Carr*, nor are they in the claims. It is my opinion that this configuration is one of several configurations that a POSITA would have interpreted

³⁷ Ex. 2012, ¶ 157.

from *Carr*, and such a configuration is not only possible but would have been reasonable, for one example, if the pairs of wells were located at different pads. Nothing in Mr. Hughett’s discussion (or that of the Patent Owner, as discussed above) changes the fact that *Carr* describes applying a technique applicable to “multiple wells.”³⁸

28. Mr. Hughett further ignores the entire teaching of *Carr* and focuses instead on a single image to make the incorrect statement that “once fluid has entered each isolated manifold path, neither first valve 470 nor second valve 472 has the capability to redirect fluid between wells 140 and 142.”³⁹ Mr. Hughett apparently only looked at Fig. 5 and not the text describing the embodiment. *Carr* also teaches that the valves can be disposed “outside of the manifold 120 or disposed within the manifold 120.”⁴⁰ They just have to be along the flow path (before, in, or after the manifold).⁴¹ Of course, with the valve inside the manifold (*i.e.* part of the manifold), Mr. Hughett’s statement is simply wrong, and fluid is redirected after it has entered the manifold. Even so, the claims do not require that the valves be outside, within, fluidly before, fluidly after, attached to, separate from the manifold—they just require certain valves (first/third valve) be “associated” with the manifold. Mr.

³⁸ Ex. 1002, ¶¶ 335-345.

³⁹ Ex. 2012, ¶ 168.

⁴⁰ Ex. 1004, [0033].

⁴¹ Ex. 1002, ¶¶ 435-439 quoting *Carr*, [0033].

Hughett makes a similar statement when discussing the combination of *Carr* and *Beuterbaugh* which is equally wrong.⁴²

29. In the same paragraph, Mr. Hughett also incorrectly states, without any support, “the system of *Carr* cannot provide a substantially constant pressure of hydraulic fracturing fluid to two wells at a constant rate, as *Beuterbaugh* does.”⁴³ Again, it is unclear what assumptions Mr. Hughett has made in making this assertion, but it would have been clear to a POSITA that *Carr*’s system certainly is capable of providing a substantially constant pressure of hydraulic fracturing to two wells at a constant rate. If that were necessary (which it is not in the combination of *Carr* / *Beuterbaugh* nor in the claims), an operator would simply control the valves and pumps to provide a substantially constant pressure at a constant flowrate to all wells. It could even be the same pressure and flowrate for each well, though this is certainly not required in the claims or the combination.⁴⁴ Further, the claims do not require continuously running the pumps while operating the valves. A POSITA would have found it obvious to operate the valves and/or pumps, as *Carr* teaches, which could include opening/closing valves and/or adjusting the speed of the pumps, to prevent damage to the pumps. For example, one could turn off the pumps to prevent deadheading.

⁴² Ex. 2012, ¶ 178.

⁴³ Ex. 2012, ¶ 178.

⁴⁴ Ex. 2013, 94:13 – 97:4.

30. Further, Mr. Hughett makes the incorrect statement that there are “vast structural and operational differences” between *Beuterbaugh* and *Carr*.⁴⁵ That is incorrect. *Carr* and *Beuterbaugh* both teach simultaneous or concurrent fracturing operations on multiple wells and are “directed to solving the same problem—controlling well operations.”⁴⁶ While there are some differences in the location of particular valves or some of the operational steps, the overall structure of *Carr* and *Beuterbaugh* is very similar, as described in my First Declaration.⁴⁷ For example, *Carr*’s valves and/or pumps can be controlled according to *Carr*’s methods, to use *Beuterbaugh*’s overlapping valve sequence. Further, any operational differences would not have prevented a POSITA, with a reasonable expectation of success, from incorporating the teachings of *Beuterbaugh* (particularly the portions that I relied on in my analysis) into *Carr*. For example, a POSITA would have had a reasonable expectation of success in using *Beuterbaugh*’s valve sequence with *Carr*’s system to control pressurized fluid flow from a common source to one or more wells.

VII. GROUND 5: OBVIOUS OVER *CARR* IN VIEW OF *BEUTERBAUGH*

31. Patent Owner and Mr. Hughett contend that a POSITA would not have incorporated the pulse system of *Beuterbaugh* into the system of *Carr* because the

⁴⁵ Ex. 2012, ¶ 181.

⁴⁶ Ex. 1002, ¶¶ 488-489.

⁴⁷ Ex. 1002, ¶¶ 488-495.

systems are fundamentally incompatible.⁴⁸ They are not. While there are some differences in the location of particular valves or some of the operational steps, the overall structure of *Carr* and *Beuterbaugh* is very similar, as described in my First Declaration.⁴⁹ Thus, the teachings of *Carr* and *Beuterbaugh* are *compatible*. Patent Owner apparently misunderstands the combination of *Carr* and *Beuterbaugh*. As explained in my First Declaration, and as the Board recognized in the Institution Decision, in the combination, there is no bodily incorporation of *Beuterbaugh*'s "pulse" technique into *Carr*. Instead, I relied on *Beuterbaugh* to teach "closing the first valve after opening the second valve" and the use of computerized controllers,⁵⁰ as well as clarifying that "multiple wells" includes more than the two wells detailed in *Carr*.⁵¹ As explained in my First Declaration, a POSITA would have been motivated to combine the teachings of *Carr* and *Beuterbaugh*, and to the extent that *Carr* does not render all of the claims obvious, *Beuterbaugh* provides additional support for those claim limitations discussed.⁵²

⁴⁸ POR, 37; Ex. 2012, ¶ 176.

⁴⁹ Ex. 1002, ¶¶ 488 – 495.

⁵⁰ Ex. 1002, ¶¶ 498-504.

⁵¹ Ex. 1002, ¶¶ 513-516.

⁵² Ex. 1002, ¶¶ 488-495.

VIII. GROUND 6: OBVIOUS OVERCARR IN VIEW OF *BEUTERBAUGH* AND *JACKSON*

32. Patent Owner does not dispute that *Jackson* teaches the use of flowrate thresholds as a condition that fluid has satisfied, nor that the thresholds are used to move to the next step/stage of fracturing operations. Instead, the Patent Owner argues that *Jackson* does not teach using flow-rate conditions to “determine *when to switch fracturing from one well to another*, as required by the Challenged Claims.”⁵³ Nothing in the claims requires switching fracturing from one well to another. Nevertheless, using a fracturing plan with flowrate thresholds for moving stage-to-stage in a single well would be equally applicable with multi-well fracturing plans, where the different stages would just be in different wells.⁵⁴ Even Patent Owner’s expert, Mr. Hughett, admits that it was standard for fracturing operations to include moving from stage to stage, whether in a single well or multiple wells, according to a fracturing schedule, and that moving from stage to stage in multiple wells would include alternating between wells.⁵⁵ A POSITA, therefore, would have reasonably applied the teachings of *Jackson* to the *Carr/Beuterbaugh* fracturing system.⁵⁶ Application of schedules using flowrate thresholds, as taught in *Jackson*, for stages in multiple wells, as taught in the combination of *Carr* and *Beuterbaugh*,

⁵³ POR, 41 (emphasis in the original).

⁵⁴ Ex. 1002, ¶¶ 532 – 532.

⁵⁵ Ex. 1043, 18:1-19:24, 22:18-24:11.

⁵⁶ Ex. 1002, ¶¶ 525 – 528.

would obviously only involve mere repetition of processes and equipment for one well to multiple wells. Furthermore, Mr. Hughett admits that POSITAs were “always trying to be as productive as [possible] at the well site,” including “try[ing] to move to a next well stage as fast as possible.”⁵⁷ Accordingly, it would have been obvious to a POSITA to use *Jackson*’s methods for determining when to move to the next stage.

IX. GROUND 7 & 8: ANTICIPATED BY AND/OR OBVIOUS OVER TOLMAN

A. FRAC TREES AND ASSOCIATED TREE VALVES WERE ROUTINE, CONVENTIONAL, AND WELL-KNOWN FOR DECADES PRIOR TO TOLMAN OR ’770 PATENT

33. In both Mr. Hughett’s POPR declaration (Ex. 2006) and in his deposition, he describes routine, conventional, and well-known fracturing trees (frac trees) containing multiple valves, including at least a master valve(s).⁵⁸ Mr. Hughett described a frac tree as “conventional structures that have long been known and used in the industry.”⁵⁹ Further, Mr. Hughett states that the frac trees have been used on “[v]irtually every well that I have been involved with since the development of the frac tree”⁶⁰ and that the frac tree was developed in the 1980s.⁶¹ I agree with Mr.

⁵⁷ Ex. 1043, 35:19-24.

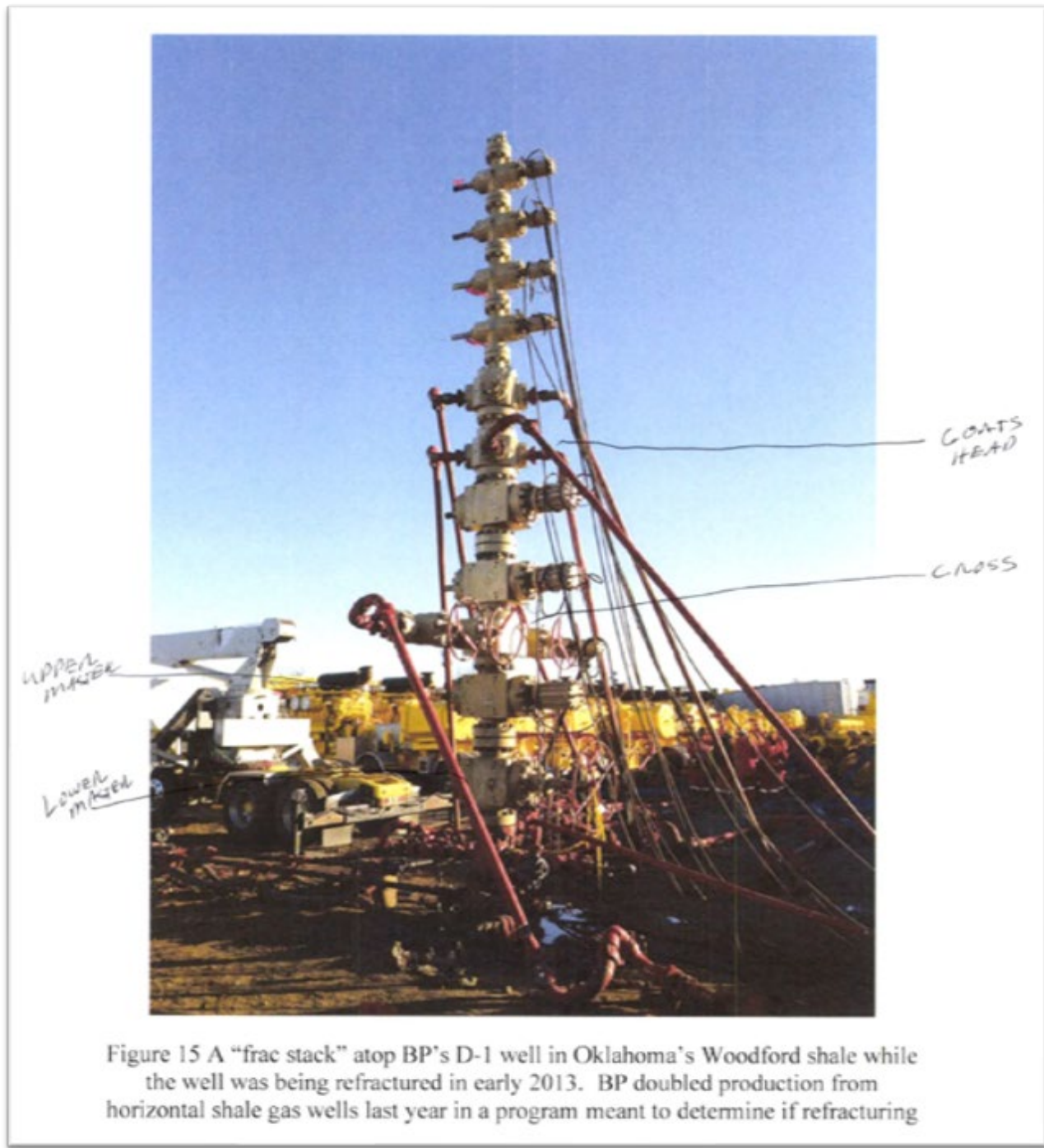
⁵⁸ Ex. 2006, ¶ 98; Ex. 1043, 45:11-13; 46:9-47:12; 48:2-54:9.

⁵⁹ Ex. 2006, ¶ 48; Ex. 1043, 51:20-24.

⁶⁰ Ex. 1043, 53:11-14

⁶¹ Ex. 1043, 51:20-52:5.

Hughett's deposition testimony describing frac trees, as well as his markup of Fig. 15 from Ex. 2006, which has been added to the record as Ex. 1038 and duplicated below.



34. I further agree with Mr. Hughett’s deposition testimony that at least the upper master valve (annotated above) and the two fracturing valves between the goat’s head and the cross (fracturing valves) are commonly hydraulically and remotely operated.⁶² A POSITA would have been well aware of the common use of “tree valves” as described in *Tolman* and would have immediately envisioned a setup similar to that of Figure 15 above, including hydraulically and remotely operated master valves and frac valves. As Mr. Hughett admits, a POSITA would have also been well aware that it was “standard” for such “tree valves,” as described in *Tolman*, to include a master valve as “the ultimate valve for allowing or preventing flow into or out of the well,” and that the master valve is closed to “shut-in” the well.⁶³

B. TOLMAN’S CONTROLLER CONTROLS THE ENTIRE SYSTEM, INCLUDING TREE VALVES.

35. It is undisputed that *Tolman* describes a processor-based controller that controls valves. The Patent Owner contends that *Tolman*’s controller “exclusively” relates to manifold well valves 214, 216, and 218.⁶⁴ The Patent Owner cherry picks

⁶² Ex. 1043, 50:8-16; 50:25-51:5; 52:9-15.

⁶³ Ex. 1043, 46:18-47:19; 51:6-12.

⁶⁴ POR, 54.

only a portion of the paragraph of *Tolman* that I relied on in my first declaration.⁶⁵ I have duplicated the entire paragraph below.⁶⁶

Further, in another alternative embodiment, it may be beneficial to have automated devices, such as processor-based devices, which are utilized for the stimulation operations. For instance, the stimulation fluid pumping system **202** may be automated and controlled by a processor-based device, such as a computer system. With the computer system, the stimulation treatment schedules for each individual stimulation treatment may be pre-programmed into the computer system. Also, the pumping system manifold **206** may include a processor-based device, such as a computer system, as well. The computer system for the pumping system manifold **206** may include mechanisms to adjust the valves **210**, **214**, **216** and **218** between the open and closed positions, and communicate with the various gauges **220**, **222** and **226** and ball-sealer injector **224**. In fact, the computer systems of the stimulation fluid pumping system **202** and the pumping system manifold **206** may be configured to interact with each other to manage the pumping stimulation treatment process for the plurality of wells **104a-104c**.

36. As is clear from at least this paragraph of *Tolman* “the stimulation fluid pumping system **202** may be automated and controlled by a processor-based device, such as a computer system,” and that “[w]ith the computer system, the stimulation treatment schedules for each individual stimulation treatment may be pre-programmed into the computer system.” This description is provided in the context of reducing risks associated with concurrently or simultaneously performing various operations on different wells on a single surface pad.⁶⁷ *Tolman* teaches that devices

⁶⁵ Ex. 1002, ¶¶ 626-627; 664-665.

⁶⁶ Ex. 1002, ¶¶ 626, 664, quoting Ex. 1006 at 14:3-22.

⁶⁷ Ex. 1006, 13:1-14:22.

automated and controlled by a processor-based device may be used in stimulation operations to reduce these risks, providing examples of such automated and controlled devices.⁶⁸ Thus, the computer system would have been used to control the entire system, including the tree valves which contain the remotely operated master valves and frac valves described by Mr. Hughett. A second (sub) processor-based controller is included as part of the manifold 206 and is used as an example to control the manifold valves. However, a POSITA would not have read the entire disclosure of *Tolman* and come away with the idea that a controller could *only* be used to control the example valves associated with the manifold, but would instead understand that the controller would be used to control pumps and valves throughout the system to reduce risks. Computerized control systems have been used in fracturing operations since at least the early 1990s. Accordingly, *Tolman* discloses the use of controllers to control the tree valves, or at least such a configuration would have been obvious to a POSITA based on the teachings of *Tolman* and the well-known use of computerized controllers in fracturing.

C. MR. HUGHETT MAKES SEVERAL CRITICAL ERRORS IN HIS DECLARATION.

37. In addition to the errors discussed above regarding Mr. Hughett's analysis of *Carr* and *Carr/Beuterbaugh*, Mr. Hughett makes critical errors in his

⁶⁸ Ex. 1006, 13:1-14:22.

analysis of *Tolman*. For example, Mr. Hughett quotes *Tolman* to say that wells not being treated are “‘hydraulically isolated from the pressure and energy created by the stimulation fluid pumping system’ so that operators may perform other operations on those isolated wells.”⁶⁹ Mr. Hughett then goes on to suggest that this prevents *Tolman* from teaching the claimed valve sequencing because “while *Tolman*’s technique may “reduce ‘non-pumping time’ time” between well stimulations, [] it does not eliminate it.”⁷⁰ Of course, the claims do not require an elimination (nor a reduction) in non-pumping time. Nor does this *Tolman* quote require any closing of the tree valves described in *Tolman*. At most, this statement suggests closing manifold valves (e.g. 214, 216, 218) when the well associated with a particular valve is, for example, being flowed back. Further, it is exactly the “other operations” on the non-stimulated wells that teach the valve sequence of *Tolman*. Mr. Hughett testified that during the “other operations” (e.g., wireline, flowback) the master valves (tree valves) would have been open, and this was a well-known and common practice.⁷¹

38. Mr. Hughett then goes on to somehow suggest that the “tree valves” do not meet all the limitations of the claimed “first valve” because the tree valves “used

⁶⁹ Ex. 2012, ¶ 194.

⁷⁰ Ex. 2012, ¶ 194.

⁷¹ Ex. 1043, 51:20-54:9.

during flowback operations communicate fluid *out of a well*, not *to* a well.”⁷² This is incorrect and was contradicted by Mr. Hughett’s deposition testimony, where he agreed that the master valves (one of *Tolman*’s tree valves) control fluid flow into or out of their associated wells and that these valves were all standard components used long before the ’770 Patent was filed or *Tolman* was issued.⁷³ Further, Mr. Hughett agreed that the master valves are used (*i.e.*, open) during both stimulation and flowback operations; accordingly, they are used during flowback operations.⁷⁴ It is simply wrong to state or imply that tree valves used during flowback only communicate fluid out of a well, not to a well.

39. Further, Mr. Hughett misunderstands or ignores my (and Petitioner’s) description of the tree valve associated with the first well and uses this to state that *Tolman* does not teach or suggest “closing the first valve after opening the second valve.” I clearly state in my first declaration, “the ‘tree valve’ *installed on tree 106a* would be used to communicate fluid to the ‘first well’ from the pumping system through manifold **206**, and the valve is associated both with the manifold and the first well” as one example of a “first valve.”⁷⁵ Further, it is clear that this tree valve installed on tree 106a is the valve that stays open during stimulation of the second

⁷² Ex. 2012, ¶¶ 204-206.

⁷³ Ex. 1043, 46:18-53:5.

⁷⁴ Ex. 1043, 53: 21-54:9.

⁷⁵ Ex. 1002, ¶ 544.

well (second valve 216 is opened), and is closed after the flowback is finished (after opening second valve 216).⁷⁶

40. Despite this, Mr. Hughett states “when ‘fluids are flowed back in the second well,’ the second well’s manifold well valve 216 (alleged ‘*second valve*’) must *already be closed*, as explained in the portions of *Tolman* cited by Petitioner.”⁷⁷ In an attempt to support this, Mr. Hughett appears to quote the Petition, “When fracturing operations are completed in the second well and fluids are flowed back through the second well, the first well is shut-in.”⁷⁸ Thus, according to Mr. Hughett, “if the first well’s tree valve (alleged “*first valve*”) is closed during shut-in, which occurs when the second well is being flowed back, then the second manifold well valve 216 (alleged “*second valve*”) must necessarily already be closed—*i.e.*, it is not closed *after* the tree valve is closed.”⁷⁹ As discussed in my First Declaration, what *Tolman* does state, the very column that Mr. Hughett references, is that Fig. 5 illustrates the wells 104a-104c *after* the operations performed in FIG. 4 are completed.⁸⁰ Further, *Tolman* teaches:

in FIG. 5, the first well **104a** is being flowed back after the placement of proppant fractures **404, 406, 502, 504** and **506** in the region **110a** of the subsurface formation 112 to force close the proppant fractures **404, 406, 502, 504** and **506** and recover the stimulation fluid used to place

⁷⁶ Ex. 1002, ¶¶ 551-558.

⁷⁷ Ex. 2012, ¶ 216.

⁷⁸ Ex. 2012, ¶ 216.

⁷⁹ Ex. 2012, ¶ 216.

⁸⁰ Ex. 1006, 11:4-5.

the proppant fractures **404**, **406**, **502**, **504** and **506**, and produce hydrocarbons to the sales lines. Concurrently, the second well **104b** may be receiving the five-stage JITP hydraulic proppant fracture treatment. It should be noted that for this stimulation operation, the main manifold valve **210** and second manifold well valve **216** are in the open position, while the first manifold well valve **214** and third manifold well valve **218** are in the closed position to create a second well flow path.

...Fig. 6 illustrates the wells 104a-104c after the operations performed in FIG. 5 are completed. As shown in the partial view **600**, the flowback operation has been completed and the first well **104a** *has been shut-in*.⁸¹

41. Accordingly, as I describe, the first well is shut-in while the second valve is still open.⁸²

42. However, assuming *arguendo* that Mr. Hughett's interpretation is correct and that the tree valve associated with the first well is closed after manifold valve 216 is closed, that still does not show that *Tolman* does not teach "closing the first valve after opening the second valve" as Mr. Hughett claims. It is undisputed, even under Mr. Hughett's incorrect analysis, that *Tolman*'s first valve (tree valve associated with well 106a) is closed after stimulation of the second well is begun, and both manifold valve 216 and the tree valve (master valve) associated with well 106b are opened. Accordingly, even if the second manifold valve was closed before the first well was shut in, the first valve is still closed after the second valve is

⁸¹ Ex. 1006, 11:8-49 (emphasis added).

⁸² Ex. 1002, ¶¶ 551-555 quoting *Tolman*.

opened. The claims are silent as to a time frame for closing the first valve (other than after opening the second valve) and are equally silent to the position of the second valve when the first valve is closed. Patent Owner could have claimed that the second valve is still open when the first valve is closed (as they have in other patent applications), but they failed to do so in the '770 Patent, choosing, instead, to write the claims more broadly.

X. SECONDARY CONSIDERATIONS

43. I have considered the information supplied by Patent Owner regarding secondary considerations of non-obviousness.⁸³ I have not seen any evidence that would support a conclusion of nexus between the broad and previously-known valve operations claimed in the '770 Patent and the purported secondary considerations of non-obviousness presented by Patent Owner. As Patent Owner states, I understand that the “evidence of secondary considerations [must be] the ‘direct result of the unique characteristics of the claimed invention.’”⁸⁴ The information supplied by Patent Owner relates to the “Freedom Series” of equipment which Patent Owner does not at all map to each and every limitation of any claim in the '770 Patent. Patent Owner did not provide, for example, a claim chart, or any other claim analysis. Instead, Patent Owner simply broadly concludes that the Freedom Series

⁸³ POR, 60-69; Ex. 2012, ¶¶ 233-241; Ex. 2032, ¶¶ 9-28.

⁸⁴ POR, 67.

is an embodiment of the '770 Patent. This is not enough to show nexus, which I understand is required for purposes of secondary considerations.

44. Further, while the Freedom Series may have various features touted by Patent Owner (including continuous pumping, FSiControl, automated workflows, Automated Latch, Automated Valve, Automated Lubricator, Automated greasing, data interlocks, streaming of data to the cloud or a third party, red-zone free operations, automated fill, equalize & drain, automated analytics, elimination of cut wireline and more), *none of these features are claimed in the claims of the '770 Patent.*⁸⁵ Accordingly, Patent Owner's alleged secondary considerations related to the Freedom Series do not have a nexus to any claim of the '770 Patent. In addition to not establishing a nexus with a commercial embodiment that tied to any claim in the '770 Patent, Patent Owner also did not provide any evidence of long-felt need, expert skepticism, copying/licensing, nexus-tied industry praise, nexus-tied commercial success, or unexpected results.

XI. GROUNDS 1 & 2: ANTICIPATED BY AND/OR OBVIOUS OVER KRUPA

45. I incorporate my analysis and opinions regarding *Krupa* from my first declaration. In addition, I've reviewed Downing's POPR argument that *Krupa* is disqualified as prior art under 35 U.S.C. § 102(b)(2)(B) in view of disclosures

⁸⁵ Ex. 2014, generally.

Downing allegedly made on its website. I've been asked to compare that website (Ex. 2002) with the disclosures from *Krupa* that were relied on in my first declaration that in my opinion show *Krupa* anticipating/rendering obvious the Challenged Claims, to determine if the disclosures in the two are the same. I've performed that analysis and have reached the conclusion that they are not the same because *Krupa* discloses much more than Downing's website, and Downing's website is missing critical disclosures found in *Krupa* that help establish that *Krupa* anticipates/renders obvious the Challenged Claims. Downing's website does not disclose, for example, *Krupa*'s valve sequencing, manifold connection to multiple wells, opening multiple valves to one well while fluid is pumped through valves into another well, hydraulically fracturing the wells, or using operational conditions (including flowrate) for determining when to move to the next step in the fracturing plan. Downing's website's single sentence related to valve sequence ("transition the zipper valves from one well to the other, opening the second well and subsequently shutting in the first well, all while pumping") is not the same as *Krupa*'s detailed description of valve sequencing between sets of valves positioned between a shared manifold connection and multiple wells.⁸⁶ *Krupa*'s sets of valves are operated in an overlapping sequence in response to sensor-measured flowrate and pressure

⁸⁶ Ex. 2002; *Krupa*, [0005], Figs. 2A-2G.

conditions of fluid pumped to the wells, which is also not disclosed on Downing's website.⁸⁷

XII. CONCLUSION

46. Based on my education, experience, and expertise, it is my opinion that all of the Challenged Claims are anticipated and/or obvious in view of *Krupa*, *Carr*, *Beuterbaugh*, *Tolman*, and/or *Jackson* for the reasons discussed in my Petition Declaration and above.

⁸⁷ Ex. 2002; *Krupa*, [0005], Figs. 2A-2G, [0024]-[0026], [0042].

All statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. I further understand that willful false statements and the like are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code. I declare under penalty of perjury that the foregoing is true and correct.

Executed on December 9, 2024.



Dr. Robert A. Durham