IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLORADO

Case No. 1:23-cv-01180-RMR-SP

DOWNING WELLHEAD
EQUIPMENT, LLC,

Plaintiff,

v.

INTELLIGENT WELLHEAD
SYSTEMS, INC., INTELLIGENT
WELLHEAD SYSTEMS, CORP., and
IWS USA CORP.,

Defendant.

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT,
PERMANENT INJUNCTIVE RELIEF REQUESTED,
AND DEMAND FOR A JURY TRIAL

Plaintiff Downing Wellhead Equipment, LLC, for its First Amended Complaint and demand for a jury trial seeking relief for patent infringement against Defendants Intelligent Wellhead Systems, Inc., Intelligent Wellhead Systems, Corp., and IWS USA, Corp. (collectively, "IWS" or "Defendants"), states and alleges as follows:

I. The Parties

1. Plaintiff Downing Wellhead Equipment, LLC is an Oklahoma Limited Liability Company with its principal place of business located at 2601 NW Expressway, Suite 900E, Oklahoma City, Oklahoma 73112.

2. On information and belief, Defendant Intelligent Wellhead Systems, Inc. is a Canadian corporation with its principal office at 7633-57 Street SE, Suite 52, Calgary, Alberta T2C-5M2.

3. On information and belief, Defendant Intelligent Wellhead Systems, Corp. is a Delaware corporation with its principal office at 7633-57 Street SE, Suite 52, Calgary, Alberta T2C-5M2.

4. On information and belief, Defendant IWS USA, Corp. is a Delaware corporation having a principal place of business at 511 16th Street, Suite 500, Denver, Colorado 80202.

5. On information and belief, Defendants maintain United States business operations in one or more of Denver, Colorado, Midland, Texas, and Houston, Texas. *See* https://www.intelligentwellheadsystems.com/about/.

6. On information and belief, Defendants work together to provide technologies for manipulating the valves necessary to conduct hydraulic fracturing operations.

II. Jurisdiction and Venue

7. This Court has subject-matter jurisdiction over Downing's claims under 28 U.S.C. §§ 1331 and 1338(a) because these claims arise under the patent laws of the United States, 35 U.S.C. § 1, *et seq*.

8. Defendants are subject to this Court's general and specific personal jurisdiction at least because: (1) at least Defendant IWS USA, Corp. maintains a principal place of business in Colorado; (2) Defendants have registered agents for service of process in Colorado, regularly conduct business in Colorado and within

this District, and have substantial and continuous contacts within this District; (3) Defendants have purposefully availed themselves of the privileges of conducting business in this District and have a regular and established place of business in this District; and (4) Defendants have committed acts of patent infringement in this District by using, renting, offering to rent, selling, and/or offering to sell, or otherwise providing infringing products, services, and/or systems in this District.

9. Venue in this Court is proper under the provisions of 28 U.S.C. §§ 1391(c) and 1400(b) at least because: (1) Defendant IWS USA Corp. maintains a regular and established place of business in Colorado and within this District, (2) upon information and belief, Defendants Intelligent Wellhead Systems, Inc. and Intelligent Wellhead Systems, Corp. maintain a regular and established place of business in Colorado and within this District; (3) Defendants have committed acts of patent infringement in this District by using, renting, offering to rent, selling, and/or offering to sell, or otherwise providing infringing products, services, and/or systems in this District, and (4) Defendant Intelligent Wellhead Systems, Inc. is a foreign corporation and, therefore, subject to venue in any judicial district in the United States.

III. Downing and Continuous Pumping

10. Downing is a leading American oilfield solutions provider specializing in pressure-control technologies for hydraulic fracturing. Since 1980, Downing has designed, manufactured, and delivered the industry's most advanced and reliable wellhead and surface equipment from its manufacturing facility headquartered in Oklahoma City, Oklahoma. As a result of Downing's commitment to innovation,

Downing has developed an extensive intellectual property portfolio of more than a dozen issued patents, two of which are the subject of the present litigation.

A. Overview of Hydraulic Fracturing

11. Hydraulic fracturing was developed in the early 20th Century and has become an essential process in the production of oil and gas in North America. Ex. 1, *Hydraulic Fracturing and its Effects on Frac Pump Technology*, PUMPS & SYSTEMS (Mar. 09, 2012).[1] "[M]ost experts now project at least 90 percent of all future wells in North America will require some degree of fracturing to increase production results, with the majority of these operations occurring in shale gas formations." Ex. 1 at 1. Innovations in hydraulic fracturing technologies are vital to allow the oil and gas industry to meet growing global energy demands. Ex. 1 at 2.

12. Hydraulic fracturing increases well production by applying hydraulic pressure to create fractures in a formation, allowing increased extraction of oil and gas. Hydraulic fracturing relies on pumping operations to achieve the desired pressure in the well. Hydraulic fracturing may be accomplished by creating multiple fracture zones within a well, called "stages." Depending on the length of the well, there may be anywhere between 10 and 100 or more stages.

13. One method of fracturing, known as "perforation" or "plug and perforate" (PnP), involves positioning an explosive device (known as a "perforating gun") in a well via wireline. Ex. 2, Huchton, *et al.*, *New Multi-Chamber Valve Saves*

[1] https://www.pumpsandsystems.com/hydraulic-fracturing-and-its-effect-frac-pump-technology.

Time, Improves Safety on Midcontinent Unconventional Well, AADE (2019).[2] The PnP method is advantageous in that it "provides the ability to pinpoint[:] fracture locations with perforating guns; adjust stage spacing during the completion; achieve zonal isolation between stages; and complete a hundred or more stages in a horizontal well." Ex. 2 at 1.

14. Although the PnP method is the preferred fracturing method in North America due to its distinct advantages, "the traditional plug-and-perf method is highly inefficient and requires personnel to work [] in the red zone."[3] Ex. 3, Johnson, *Automation results in significant completion efficiency gains in Delaware*, World Oil (Nov. 2019) at 3. For example, "[t]raditional wireline tool deployment [] involves three steps." Ex. 2 at 1. "First, the working valve on the frac tree is shut manually by a person working in the red zone, and the wireline operator picks up the gun assembly and suspends it over the frac head and the red zone operator." Ex. 2 at 1. "Next, the operator in the red zone installs the wireline lubricator." Ex. 2 at 1. "The working valve is [then] opened and the wireline tools can be lowered into the well." Ex. 2 at 1. "This process can take 30-45 minutes." Ex. 2 at 1.

15. Further, "[p]ulling the wireline tools after perforating can be equally time-consuming." Ex. 2 at 1-2. "During the traditional process, the operator in the red zone closes the working valve manually, releases the lubricator, and bleeds off pressure." Ex. 2 at 2. "If a ball is needed, the red zone operator drops it onto the

[2] https://www.aade.org/application/files/3415/7132/0389/AADE-19-NTCE-012_-_Huchton.pdf.

[3] The "red zone" is the area around any equipment pressurized by the pumps—this area is considered extremely dangerous and entering the "red zone" is avoided to the extent possible.

swab valve and then installs the frac head cap." Ex. 2 at 2. "[T]he red zone operator [then] opens the swab valve manually to let the ball descend down the wellbore and seat onto the frac plug so pressure pumping can begin." Ex. 2 at 2. "This post-wireline process typically takes 30-45 minutes per stage." Ex. 2 at 2. Thus, on a legacy PnP horizontal well completion, deploying wireline equipment for plug setting and perforating takes longer than the time required for pumping the frac treatment at each stage. Ex. 2 at 1.

B. Zipper Fracturing

16. A method known as "zipper fracturing" was developed to mitigate non-productive time (NPT) incurred by the single-well PnP method. Specifically, "[i]nstead of drilling and hydraulically fracturing one well at a time, the zipper method involves drilling multiple wells from a pad site and then hydraulically fracturing a stage in one well, while getting ready for the next [stage by performing] wireline and perforating operations [] in another [well]." Ex. 4, Jacobs, *The Shale Evolution: Zipper Fracture Take Hold*, JOURNAL OF PETROLEUM TECHNOLOGY (Sept. 30, 2013).[4] As a result, NPT was limited to the amount of time between completing the hydraulic fracturing stage in one well and completing the wireline and perforating operations in another well in preparation for the next hydraulic fracturing stage.

17. "When completing horizontal wells one at a time, once the fracturing job in an individual stage is finished, the wireline operation to set plugs and

[4] https://jpt.spe.org/shale-evolution-zipper-fracture-takes-hold.

perforate the next stage in the wellbore normally takes 2 to 3 hours, though it can last for as long as 5 hours between stages." Ex. 4 at 2. On the other hand, "when doing zipper fracturing the break in stimulation operations may only last 15 minutes as workers switch from one well to another." Ex. 4 at 2.

18. Because the zipper fracturing method avoids a significant amount of NPT associated with single-well PnP operations, zipper fracturing "saw widespread adoption [in the] last decade as operators started completing more multiwell pads and realized that pumping dozens of stages in a single well before moving on to another well [was] the least efficient way to develop their acreage." Ex. 5, Jacobs, *Continuous Pumping Touted as Next Efficiency Gain for US Onshore Completions*, Journal of Petroleum Technology (June 6, 2022) at 2.[5] Indeed, "[a] primary driver behind the adoption of zipper fractur[ing] has been to reduce the money and time spent completing a series of wells." Ex. 4 at 5.

19. The zipper fracturing method for multiple wells resulted in substantial efficiency gains over single-well PnP operations. However, since the legacy PnP process still took longer than completing a hydraulic fracturing stage, a significant amount of NPT still occurred (while waiting for the legacy PnP process to finish) before a well changeover could take place. That is, although the hydraulic fracturing stage had been completed in one well of the zipper, the frac operator would still have to wait for the remainder of the legacy PnP process to be completed in the next well of the zipper before the operator could initiate the hydraulic

[5] https://jpt.spe.org/continuous-pumping-touted-as-next-efficiency-gain-for-us-onshore-completions.

fracturing stage in that next well. Due to this substantial wait time, the pumps used to execute the hydraulic fracturing stages would need to be shut down, and then restarted to initiate the hydraulic fracturing stage in the next well. If pump shutdown and restart operations weren't timed perfectly, even more time would be wasted waiting for the pumps to pressure up to hydraulically fracture the next stage.

20. Subsequent technological developments have reduced the amount of NPT incurred by PnP operations during zipper fracturing. However, although these developments allowed PnP operations in a next well to finish before the fracturing stage in a previous well completed, significant NPT still remained because conventional pump swap techniques required shutting down pumping in order to change over from one well to the next. When pumps are shut down, the delays involved in well changeover and pump start-up, including repriming the pumps, result in costly NPT losses. Indeed, for zipper fracturing configurations with multiple wells, numerous pump shut-downs and restarts would be required to complete hydraulic fracturing operations, significantly compounding NPT.

C. Downing's Continuous Pumping Method

21. Downing has developed an improved process for hydraulic fracturing to eliminate efficiency losses (associated with zipper fracking using conventional well swap techniques), namely by enabling the hydraulic fracturing operation to continually pump fluid through the fracturing system as the operation moves from one well to the next. Thus, the corresponding pumps and other fracturing

equipment may continually run until the entire fracturing operation is complete. Downing's invention is a process referred to as a "continuous pumping swap" or "CP swap," which is embodied by the Asserted Patents in this case. Downing's new CP swap method provides an innovative process for transitioning from pumping one well to pumping another well in zipper fracturing operations which "eliminates the issues that prevent[ed] continuous pumping 24 hours per day," "effectively eliminating non-productive and non-pumping time." Ex. 6, Downing Website: *Introducing Continuous Pumping 24/7. Instant Transitions, Continuously Pump Stage-after-Stage-after-Stage;*[6] *see also* Ex. 7, *Liberty Announces Milestone Achievement of 24 Hours of Continuous Pumping Time*, Liberty Website (Sept. 27, 2021).[7]

22. In contrast to existing, conventional methods of well swapping during zipper fracturing, Downing's CP swap method "instantaneously transitions from one well to the other, opening the second well and subsequently shutting-in the first well, all while pumping….". Ex. 7 at 1. With Downing's CP swap method, "[t]he transition [from one well to the next] is instantaneous and the total time between stages is less than 30 seconds." Ex. 6 at 1.

23. Downing's CP swap method revolutionized the hydraulic fracturing industry, including by inventively overcoming the efficiency limitations of zipper fracturing using conventional well swap techniques. For example, with Downing's

[6] https://downingusa.com/freedomseries/continuouspumping/.

[7] https://www.libertyenergy.com/liberty-announces-milestone-achievement-of-24-hours-of-continuous-pumping-time/.

CP swap method, operators enjoy the benefits of continuous pumping without the inherent efficiency limitations of conventional well-swap techniques. *See* Ex. 1. This method is an improvement because an operator is not required to shut down one well before beginning hydraulic fracturing operations on the next well, which saves time and resources for the fracturing operation by decreasing transition times and eliminating the need to shut down and restart the high-pressure stimulation pumps.

24. Using Downing's CP swap method, oilfield services firm Liberty Oilfield Services, Inc. was able to "achieve[] the milestone of 24-hours of continuous plug and perf pumping time for Kaiser-Francis Oil Company in the Permian Basin." Ex. 7 at 1. "By delivering a full 1,440 minutes of pumping time with zero non-productive time, Liberty crews were able to attain the premier goal of Liberty's Operation 1440." Ex. 7 at 1. More recently, Downing's system was deployed "pumping 35 [hours] straight and multiple 24 [hour] pumping days." Ex. 6 at 3. At the time of Downing's CP swap invention, no other method of hydraulic fracturing provided for continuous pumping while swapping between wells during zipper fracturing.

IV. <u>The Asserted Patents</u>

25. On August 2, 2022, the USPTO duly and legally issued U.S. Patent No. 11,401,779 ("the '779 Patent"), entitled "Hydraulic Fracturing Plan and Execution of Same." Downing is the owner by assignment of the '779 Patent. A copy of the '779 Patent is attached hereto as Exhibit 8.

26. On January 24, 2023, the USPTO duly and legally issued U.S. Patent No. 11,560,770 ("the '770 Patent"), entitled "Hydraulic Fracturing Plan and Execution of Same." Downing is the owner by assignment of the '770 Patent. A copy of the '770 Patent is attached hereto as Exhibit 9.

27. Collectively, the '779 and '770 Patents are referred to as the "Asserted Patents." This is an action for infringement of the Asserted Patents.

28. Specifically, the '779 and '770 Patents describe a process for "executing [a continuous pumping swap (or "CP swap")] from hydraulically fracturing … the n_1 well (e.g., well 105D) to hydraulically fracturing … the n_1+1 well (e.g., well 105B)," which "transitions the zipper valves from one well to the other, opening the second well and subsequently shutting-in the first well, all while pumping." '770 Patent, 14:43-48. Stated differently, by opening the valve and beginning pumping into a second well, while still pumping into a first well, and then closing the valve in a first well, pumping can occur continuously throughout the changeover.

29. As shown in '770 Patent Figures 16D and 16E, during the CP swap "[t]he transition [between wells] is instantaneous and the total time between stages measured at treatment pressure is less than 20 seconds (as fast as 19 seconds in some instances)." '770 Patent, 14:49-51.

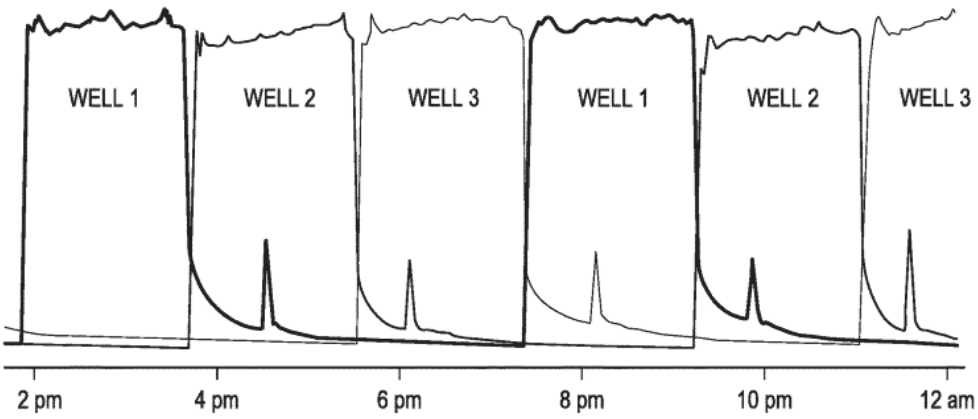


FIG. 16D

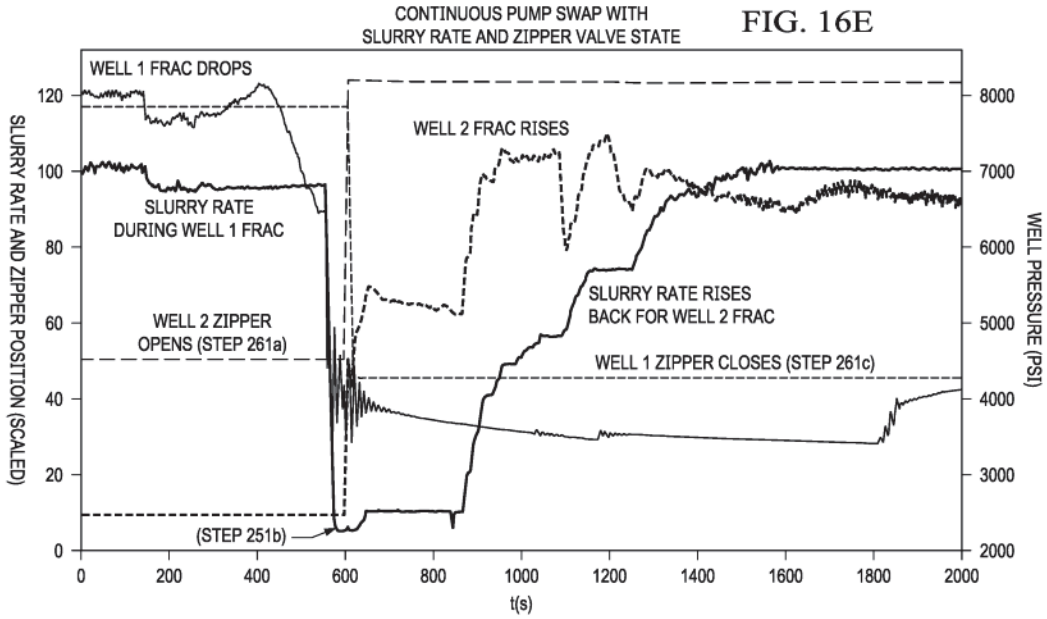


FIG. 16E

30. Referring specifically to Figure 16E, pressure and flow rate conditions are plotted against time during the CP swap from "Well 1" (e.g., well 105D of Figures 16B and 16C) to "Well 2" (e.g., well 105B of Figure 16A). The horizontal axis indicates time. The left vertical axis indicates zipper valve position, as well as slurry rate as an example flow rate condition. The right vertical axis indicates well pressure as an example pressure condition.

31. Initially, the zipper valve for Well 1 (well 105D) is fully open and the zipper valve for Well 2 (well 105B) is fully closed. As a result, the well pressure of Well 1 (well 105D) is around 8,000 psi, the well pressure of Well 2 (well 105B) is less than 3,000 psi, and the slurry rate is around 100 scaled. At step 251b, it is determined that the hydraulic fracturing fluid has satisfied a condition, namely a flow rate condition at which the slurry flow rate is below an upper threshold (about 10 scaled) and above a lower threshold (about 0 scaled). In addition to, or instead of, determining that the hydraulic fracturing fluid has satisfied the flow rate condition, at step 251b it is determined that the hydraulic fracturing fluid has satisfied another condition, namely a pressure condition at which the fluid pressure, which corresponds to the well pressure, is below an upper threshold corresponding to the well pressure (about 5,000 psi) and above a lower threshold (about 3,000 psi). In response to determining that the one or more of these conditions have been satisfied, the zipper valve for Well 2 (well 105B) is opened.

32. At this point along the horizontal axis (about 600 seconds), with both of the zipper valves for Wells 1 and 2 opened, the slurry rate is still below about 10 scaled and above about 0 scaled (indicating continuous pumping of the hydraulic fracturing fluid), the well pressure in Well 1 is decreasing, and the well pressure in Well 2 is increasing. The zipper valve for Well 1 (well 105D) is then closed after the zipper valve for Well 2 (well 105B) is opened. After the closing of the zipper valve for Well 1 (well 105D), the slurry rate increases back up to around 100 scaled, the well pressure in Well 2 (well 105B) increases and reaches steady state of between

6,000 psi and 7,000 psi, and the well pressure in Well 1 (well 105D) eventually settles to around 4,000 psi. After the passage of 20 seconds or so before the 600-second mark on the horizontal axis, the well pressure in Well 2 (well 105B) becomes about equal to what the well pressure in Well 1 (well 105D) was about 20 seconds earlier, indicating as instantaneous the transition from the frac stage at Well 1 (well 105D) to frac stage at Well 2 (well 105B).

33. This indicated instantaneous transition is shown more clearly in Figure 16D, the leftmost side of which communicates that the well pressure at Well 1 (e.g., well 105D) suddenly drops, but immediately at the drop the well pressure at Well 2 (e.g., well 105B) suddenly increases up to about the previous well pressure at Well 1 (well 105D).

34. The CP swap described in the '779 and '770 Patents enables hydraulic fracturing pressure pumps to run continuously during multiwell zipper fracturing stimulations, thereby avoiding the need to shut down the pumps between frac stages. Shutting down pumps is disadvantageous as it introduces delays, for example while the pumps are shut down, re-primed (in some instances), and restarted, as discussed above.

35. More particularly, the '779 and '770 Patents describe "various sub-steps 261a-c of the step 260," which "step 260 is or includes executing the CP swap from hydraulically fracturing … the n_1 well (e.g., well 105D) to hydraulically fracturing … the n_1+1 well (e.g., well 105B)," as shown in FIG. 15. '770 Patent, 14:17-22.

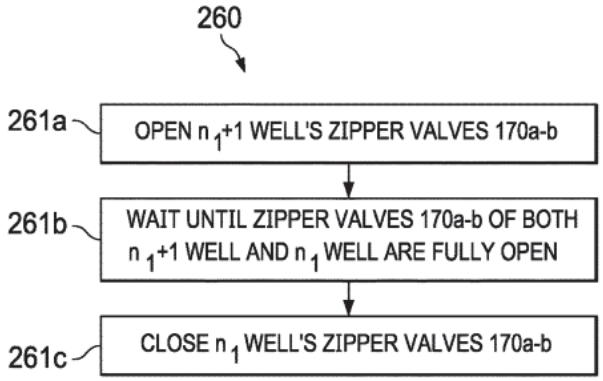


FIG. 15

36. Further, the "CP swap from hydraulically fracturing the n_1 well to hydraulically fracturing the n_1+1 well is permitted at step 260" in response to, for example, determining that "the frac rate of the n_1 well is below [an] upper threshold rate … and above [a] lower threshold rate," as shown in FIG. 12. *Id.*, 13:43-50.

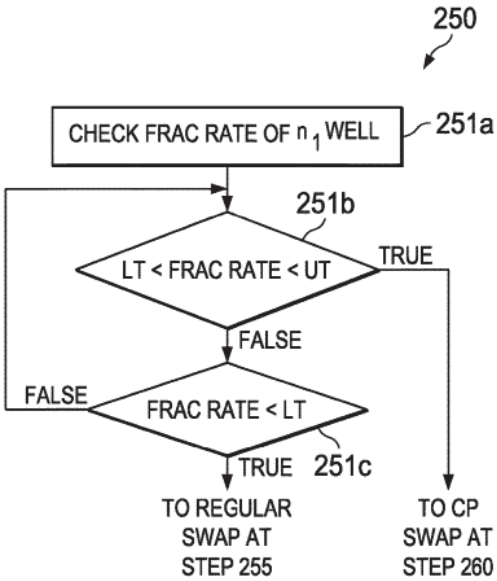


FIG. 12

37. In response to determining that, for example, the frac rate is below a predetermined threshold, "[a]t the sub-step 261a [of the step 260], the n_1+1 well's (e.g., well 105B) zipper valves 170 a-b are opened … [and] hydraulic fracturing fluid

is communicated from the zipper manifold 145 to the n_1+1 well (indicated by arrows 232n and 232o in FIG. 16A)…." *Id*. at 14:22-26. Opening the n_1+1 well's zipper valve once suitable conditions are determined to have been satisfied advantageously allows the CP swap to be completed without damaging the hydraulic fracturing system.

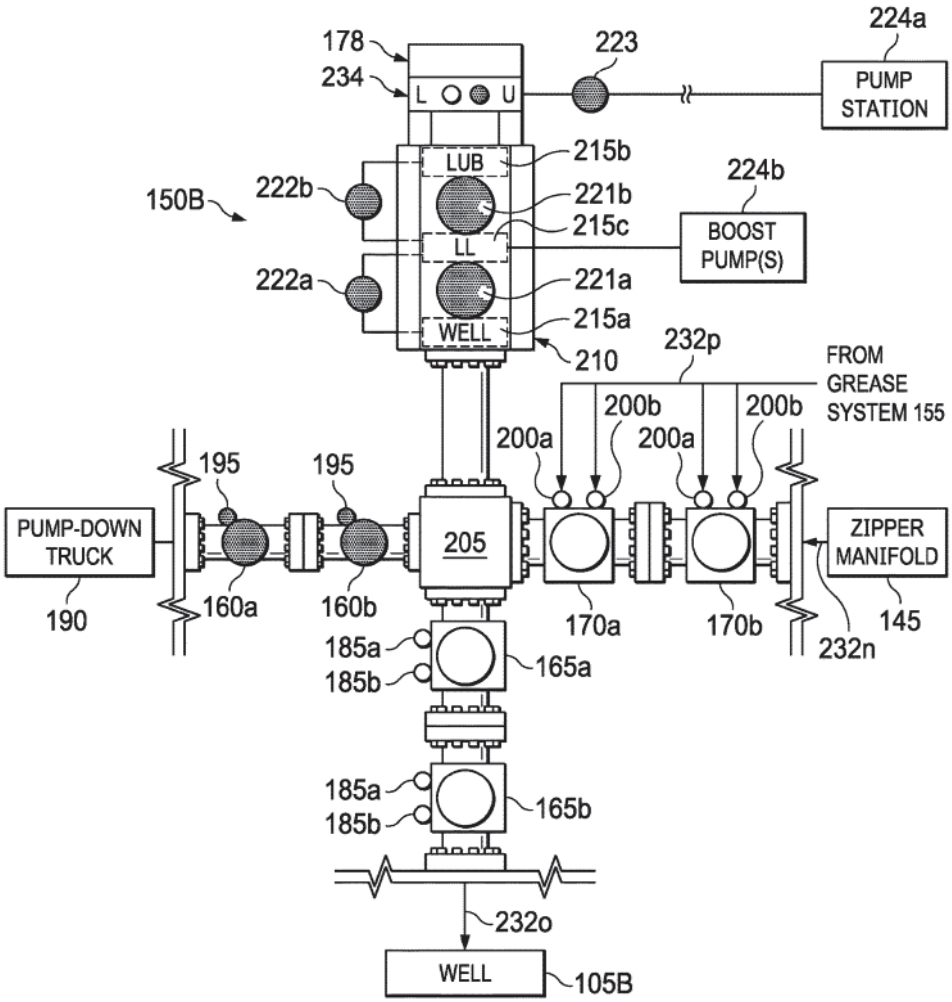


FIG. 16A

38. Then, "[a]t the sub-step 261b [of the step 260], both the n_1+1 well's (e.g., well 105B) zipper valves 170a-b and the n_1 well's (e.g., well D) zipper valves 170a-b are allowed to fully open …, so that: hydraulic fracturing fluid is

communicated from the zipper manifold 145 to the n_1 well (indicated by arrows 232l and 232m in FIG. 16B) and the n_1+1 well [(shown in FIG. 16A)]…." *Id.*, 14:29-35.

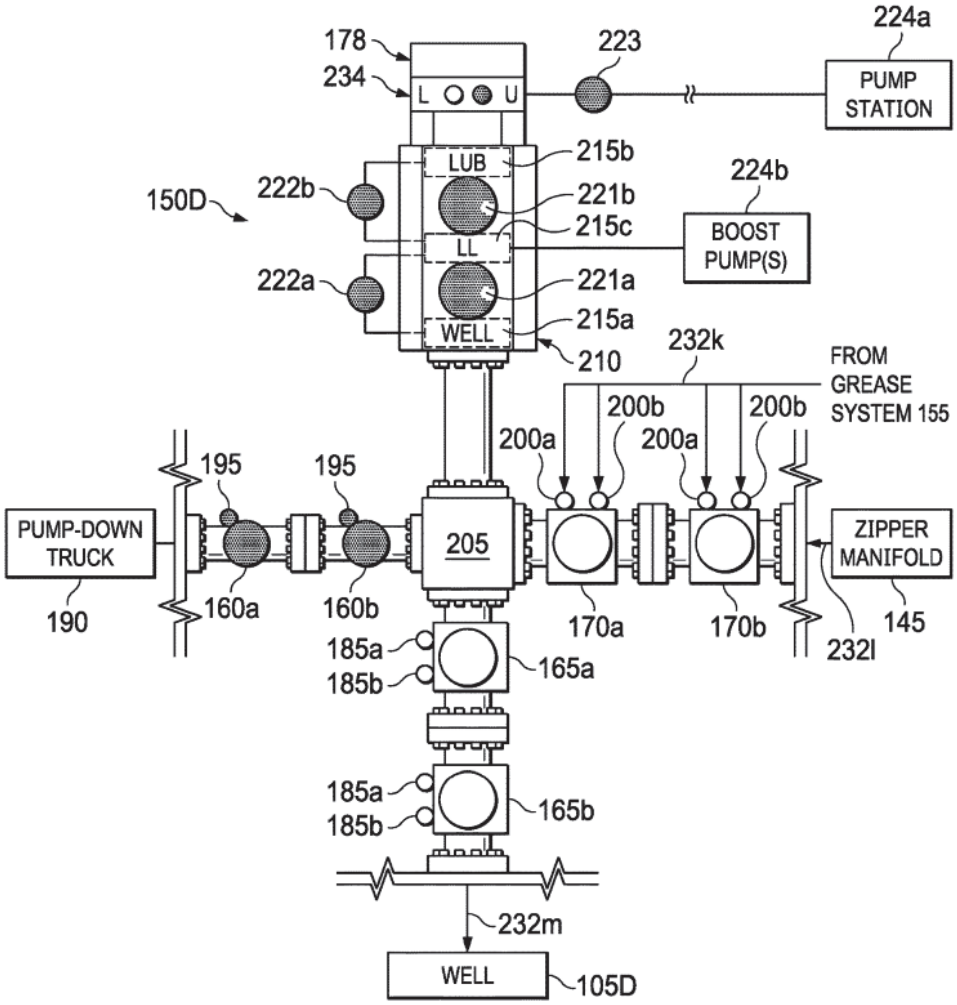


FIG. 16B

39. "Finally, at the sub-step 261c, the n_1 well's (e.g., well 105D) zipper valves 170a-b are closed," as shown in FIG. 16C. *Id.* at 14:38-40.

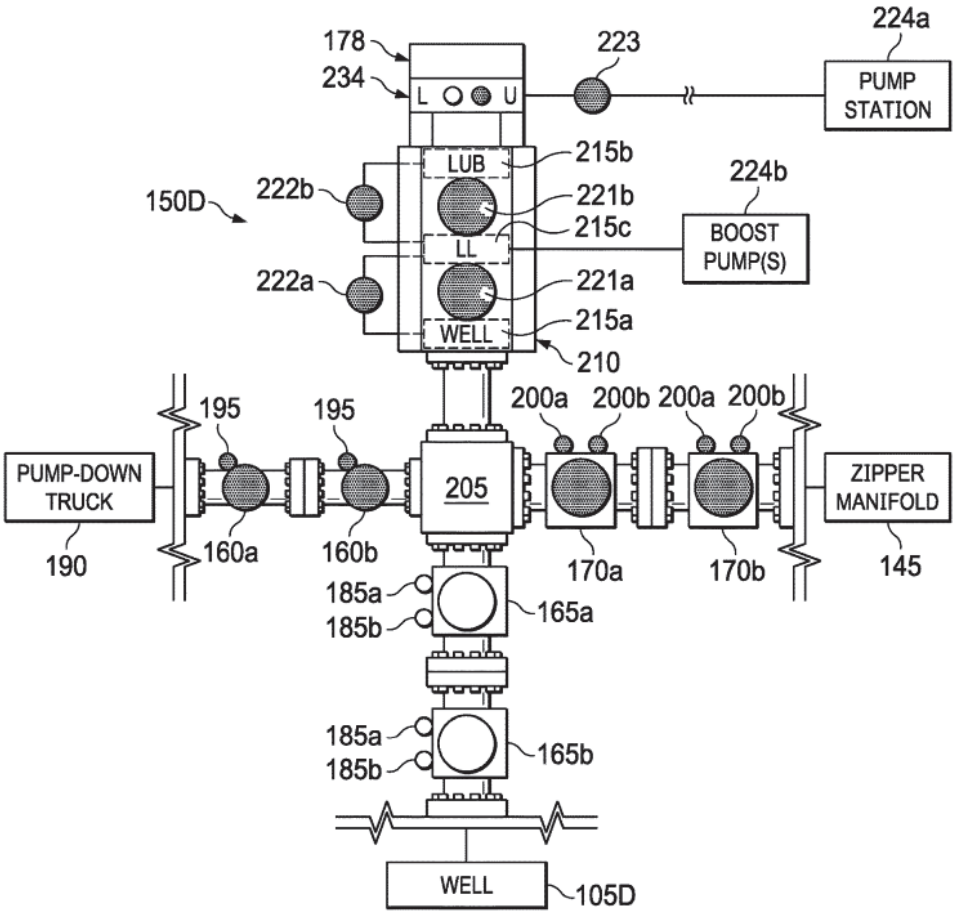


FIG. 16C

40. The '779 and '770 Patents distinguish the CP swap process from a conventional "regular swap." *See, eg., id.* at 4:22-24 ("FIG. 12 is a flow diagram illustrating various sub-steps of a sixth step of the method illustrated in FIG. 1B, which sixth step is or includes determining whether to permit a regular swap or a continuous pumping swap (or 'CP swap'), according to one or more embodiments.").

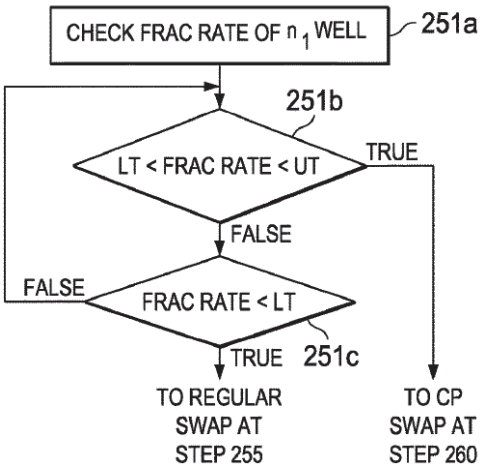


FIG. 12

41. In contrast to the inventive CP swap method of the '770 and '779 Patents, conventional regular swap methods begin by closing the valve on one well before opening the valve on the next well. With both valves closed, pumping operations must cease. Next, the valve on the second well is opened. Pumping then resumes, but a delay occurs while the pumps are primed (in some instances) and brought back up to operating pressure.

42. For example, the '779 and '770 Patents describe that a regular swap is accomplished starting "[a]t the sub-step 256a, [when] the n_1 well's (e.g., well 105D) zipper valves l70a-b are closed …, as shown in FIGS. 13 and 14A." '770 Patent, 13:61-64. Next, "[a]t the sub-step 256b, a signal to advance is received, as shown in FIG. 13." *Id.*, 13:65-66. Lastly, "[a]t the sub-step 256c, the n_1 + 1 well's zipper valves l70a-b are opened, as shown in FIGS. 10, 13, and 14B, so that hydraulic fracturing fluid is communicated from the zipper manifold 145 to the n_1+1 well (indicated by arrows 232n and 2320 in FIGS. 14B)…." '770 Patent, 14:8-15.

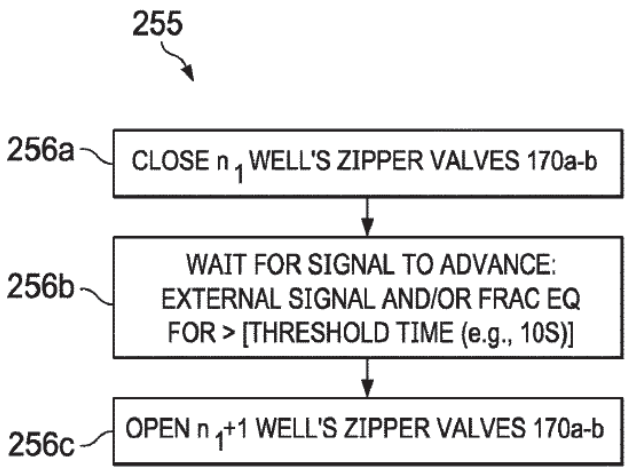


FIG. 13

A. '779 Claims 15 and 25

43. Claims 15 and 25 of the '779 Patent describe a novel method and apparatus for hydraulically fracturing a plurality of wells utilizing Downing's innovative CP swap approach.

44. Claim 15 of the '779 Patent claims:

> A method of hydraulically fracturing at least first and second wells of a plurality of wells, the first and second wells being associated with first and second valves, respectively, the method comprising:
>
> (a) permitting hydraulic fracturing of the second well, comprising: opening the second valve associated with the second well to permit pumping of fluid into the second well via the second valve; and measuring a flow rate of the fluid being pumped into the second well;
>
> (b) swapping from permitting hydraulic fracturing of the second well to permitting hydraulic fracturing of the first well, comprising: opening the first valve associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well; wherein, during step (b), hydraulic fracturing fluid is continuously pumped to the first and second valves via a hydraulic manifold; and
>
> wherein: in response to determining that the flow rate measured at step (a) has satisfied one or more flow rate conditions, the first valve

> associated with the first well is opened at step (b) before the second valve associated with the second well is closed at step (b); or in response to determining that the flow rate measured at step (a) has not satisfied one or more flow rate conditions, the first valve associated with the first well is opened at step (b) during or after the second valve associated with the second well is closed at step (b).

45. '779 Patent claim 15 recites the steps of performing a CP swap, as described by the '779 Patent and as set forth above, providing the benefits of increased efficiency and reduced NPT.

46. Specifically, in step "a" of claim 15, the method is initiated, "opening the second valve associated with the second well to permit pumping of fluid into the second well via the second valve." Additionally, the flow rate of fluid now being pumped into the second well is monitored. '779 Patent, Claim 15.

47. In step "b," the CP swap is executed by opening "the first valve associated with the first well" and subsequently closing "the second valve associated with the second well," all while "fluid is continuously pumped to the first and second valves." *Id.*

48. The last limitation of claim 15 specifies that the actions performed in step "b" take place when one or more flow rate conditions are satisfied by the flow rate monitored in step "a." *Id.* Specifically, the opening of the first valve in step "b" takes place before the second valve is closed if the flow rate condition(s) are satisfied. *Id.* In contrast, if the flow rate condition(s) are not satisfied, the first valve is closed during or after the second valve is closed in step "b."

49. Thus, claim 15 of the '779 Patent claims the inventive CP swap method described in the specification. *See, e,g*, '779 Patent, 41:49, Figs. 16A-E. The CP swap

is accomplished when suitable monitored flow rate conditions are satisfied, allowing the transition to occur as quickly as possible.

50. Claim 25 of the '779 Patent claims:

> An apparatus adapted to hydraulically fracture first and second wells, the first and second wells being associated with first and second valves, respectively, the apparatus comprising: a non-transitory computer readable medium; and a plurality of instructions stored on the non-transitory computer readable medium and executable by one or more processors, wherein, when the instructions are executed by the one or more processors, the following steps are executed:
>
> > (a) permitting hydraulic fracturing of the second well, comprising: opening the second valve associated with the second well to permit pumping of fluid into the second well via the second valve; and measuring a flow rate of the fluid being pumped into the second well;
> >
> > (b) swapping from permitting hydraulic fracturing of the second well to permitting hydraulic fracturing of the first well, comprising: opening the first valve associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well; wherein, during step (b), hydraulic fracturing fluid is continuously pumped to the first and second valves via a hydraulic manifold; and
> >
> > wherein: in response to determining that the flow rate measured at step (a) has satisfied one or more flow rate conditions, the first valve associated with the first well is opened at step (b) before the second valve associated with the second well is closed at step (b); or in response to determining that the flow rate measured at step (a) has not satisfied one or more flow rate conditions, the first valve associated with the first well is opened at step (b) during or after the second valve associated with the second well is closed at step (b).

51. Claim 25 claims a hydraulic fracturing apparatus which executes the CP swap method claimed in Claim 15, inventively providing the same benefits of increased efficiency and reduced NPT. The apparatus of claim 25 performs a CP swap that accomplishes a near instantaneous stage transition as soon as qualifying

flow rate conditions are met, completing the CP swap in as little time as possible without the need to stop pumping.

B. '770 Claims 1 and 14

52. Claims 1 and 14 of the '770 Patent describe a novel method and apparatus for hydraulically fracturing a plurality of wells utilizing Downing's innovative CP swap approach.

53. Claim 1 of the '770 Patent claims:

A method, comprising:

> communicating fluid to a first well via a manifold and a first valve, the first valve being associated with both the manifold and the first well; and
>
> in response to determining that the fluid communicated via the manifold has satisfied one or more conditions:
>
> opening a second valve;
>
> communicating fluid to a second well via the second valve; and
>
> closing the first valve after opening the second valve.

54. Claim 1 recites the steps of performing a CP swap, as described by the '779 Patent and as set forth above, providing the benefits of increased efficiency and reduced NPT.

55. Specifically, in the first limitation of claim 1, a first valve is opened and pumping in a first well begins. In the second limitation, as soon as one or more qualifying fluid conditions which signal that the CP swap method can proceed are satisfied, the second valve is opened, and pumping begins in a second well. Finally, the first valve is closed.

56. Thus, claim 1 of the '770 Patent claims the inventive CP swap method described in the specification. *See, e,g*, '770 Patent, 14:17-50, Figs. 16A-E. The CP swap is accomplished when suitable monitored pumping conditions, such as flow rate and/or pressure conditions, are satisfied, allowing the transition to occur as quickly as possible without the need to stop pumping. *See, e.g.*, '770 Patent, 14:43-48.

57. Claim 14 of the '770 Patent claims:

> An apparatus, comprising:
>
> a non-transitory computer readable medium; and
>
> a plurality of instructions stored on the non-transitory computer readable medium and executable by one or more processors, wherein, when the instructions are executed by the one or more processors, the following steps are executed:
>
> communicating fluid to a first well via a manifold and a first valve, the first valve being associated with both the manifold and the first well; and
>
> in response to determining that the fluid communicated via the manifold has satisfied one or more conditions:
>
> opening a second valve;
>
> communicating fluid to a second well via the second valve; and
>
> closing the first valve after opening the second valve.

58. Claim 14 claims a hydraulic fracturing apparatus which executes the CP swap method claimed in Claim 1, inventively providing the same benefits of increased efficiency and reduced NPT. The apparatus of claim 14 performs a CP swap that accomplishes a near instantaneous stage transition as soon as qualifying

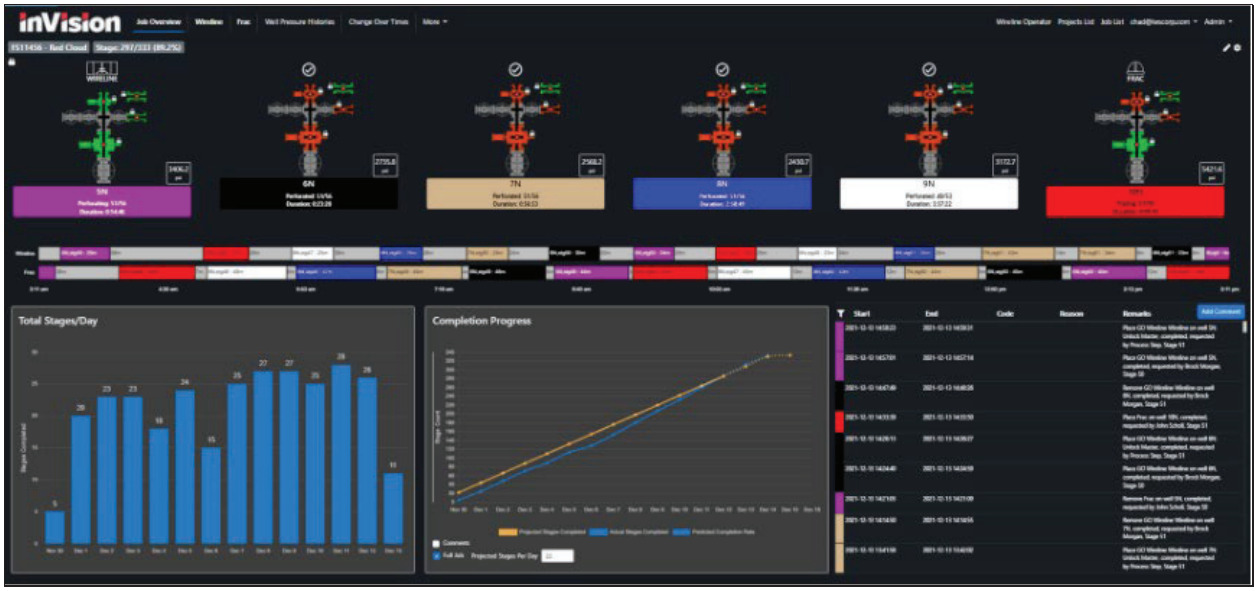
conditions are met, completing the CP swap in as little time as possible without the need to stop pumping.

V. Defendants' Infringing Activities

59. Defendants provide technology solutions for hydraulic fracturing operations and digital valve control, including but not limited to Defendants' inVision Technology Platform (collectively, "IWS's Operations Technology"), that infringes one or more claims of the Asserted Patents.

60. To further reduce time spent completing multiwell zipper fracturing stimulations, IWS reportedly "developed some of the technology used to control pumping operations" for "a [January 2022] multiwell stimulation in the DJ Basin of Colorado that is being touted for completing 72 fracturing stages in 75.4 hours of continuous pumping." Ex. 5 at 2. In particular, "the 75.4 hours of continuous pumping was achieved using the … 'zipper frac' method …" with "zero nonproductive time … incurred during the more than 3 days of continuous pumping," "translat[ing] to a 14% reduction of the time normally required to complete a five-well pad." *Id*.

61. For example, below is a screenshot of the inVision Technology Platform from IWS's website:



See https://www.intelligentwellheadsystems.com/solutions/.

62. Additionally, below is a photograph of an IWS jobsite, which shows the zipper frac method used by IWS:

IWS has used the zipper frack method to achieve "75.4 hours of continuous pumping," as described in a Journal of Petroleum Technology article. *See* Ex. 5.

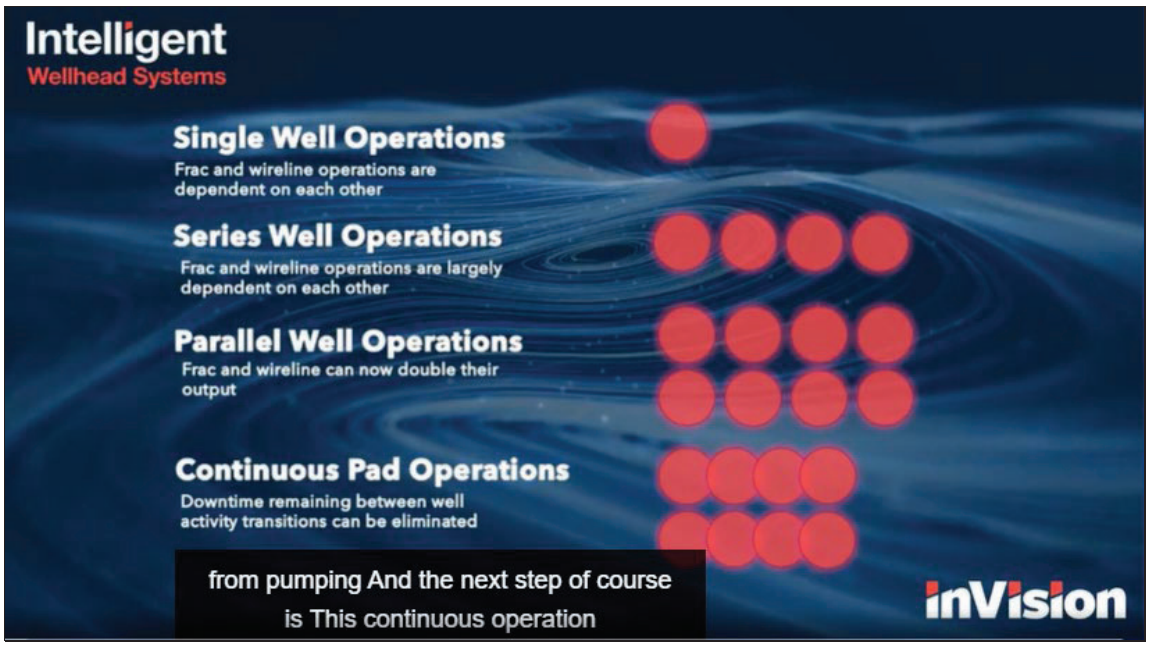
63. IWS also describes its inVision Technology Platform as follows:

> InVision software, sensors, controls, and best practices have helped deliver more than 45,000 stages without a single cut wireline, well shut-in, pressure control, or safety incident. Thanks to the inVision Digital Handshake™ and Digital Completion Twin™ technologies, reduced frac valve activation time has reached 55 percent, and wireline valve action times have been cut by 59 percent. Well swap times on some pads have been cut in half and a ***continuous pumping*** record of 76 hr has been achieved. Digital Valve Control™ technologies are the latest innovation that keeps personnel out of the red zone and improves operational efficiency and reliability.

See https://www.linkedin.com/company/intelligent-wellhead-systems/ ("About")

(emphasis added).

64. As shown below, IWS further describes its inVision Technology Platform as enabling "continuous pad operations" and "continuous pumping."



See https://www.linkedin.com/video/event/urn:li:ugcPost:6978470224329101313/.

65. Defendants are infringing one or more of the Asserted Patents by using, renting, offering to rent, selling, offering to sell, and/or otherwise providing IWS's Operations Technology, in this District.

66. Downing and Defendants are direct competitors in the market of systems and methods for controlling hydraulic fracturing operations.

67. Downing has lost substantial sales because it competes with Defendants and IWS's Operations Technology.

VI. Defendants' Infringement Is Knowing and Willful

68. Defendants knew or should have known of the Asserted Patents before they engaged in their infringing acts.

69. Downing sent letters notifying Defendants of the Asserted Patents and Defendants' infringement of the Asserted Patents on June 30, 2022, August 31, 2022, and January 9, 2023.

70. At a minimum, Defendants had notice of their infringement of the '779 Patent no later than June 30, 2022, when Downing sent Defendants a cease-and-desist letter notifying Defendants that they were infringing the allowed claims of U.S. Patent App. No. 17,388,716 ("the '716 App"), which issued as the '779 Patent on August 2, 2022. Further, Downing sent Defendants another letter on August 31, 2022, notifying Defendants that the '779 Patent had issued and confirming that Defendants infringed at least issued claims 15 and 25 of the '779 Patent.

71. At a minimum, Defendants also had notice of their infringement of the '770 Patent no later than January 9, 2023, when Downing sent Defendants another letter notifying Defendants that they were also infringing the allowed claims of U.S.

Patent App. No. 17,878,493 ("the '493 App"), which is a continuation of the '779 Patent and issued as the '770 Patent on January 24, 2023.

72. Despite Downing's repeated notice, Defendants refused to cease their infringing activities. Thus, Downing was forced to bring this suit to protect its business and intellectual property.

73. Defendants have, and continue to, willfully, knowingly, and intentionally infringe the Asserted Patents.

VII. FIRST CLAIM FOR RELIEF

(Direct Infringement of the '779 Patent)

74. Downing realleges paragraphs 1-73 above as if fully set forth herein.

75. The '779 Patent is a valid, enforceable patent that was duly issued by the USPTO on August 2, 2022.

76. Downing is the assignee of the '779 Patent with ownership of all substantial rights in the '779 Patent, including the right to exclude others and to enforce, sue, and recover damages for past and future infringements.

77. Defendants have directly infringed, and continue to directly infringe, at least claims 15 and 25 of the '779 Patent in violation of 35 U.S.C. § 271(a) by, for example and without limitation, using, renting, offering to rent, selling, offering to sell, and/or otherwise providing IWS's Operations Technology.

78. Claim 15 of the '779 Patent claims:

> A method of hydraulically fracturing at least first and second wells of a plurality of wells, the first and second wells being associated with first and second valves, respectively, the method comprising:

> (a) permitting hydraulic fracturing of the second well, comprising: opening the second valve associated with the second well to permit pumping of fluid into the second well via the second valve; and measuring a flow rate of the fluid being pumped into the second well;
>
> (b) swapping from permitting hydraulic fracturing of the second well to permitting hydraulic fracturing of the first well, comprising: opening the first valve associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well; wherein, during step (b), hydraulic fracturing fluid is continuously pumped to the first and second valves via a hydraulic manifold; and
>
> wherein: in response to determining that the flow rate measured at step (a) has satisfied one or more flow rate conditions, the first valve associated with the first well is opened at step (b) before the second valve associated with the second well is closed at step (b); or in response to determining that the flow rate measured at step (a) has not satisfied one or more flow rate conditions, the first valve associated with the first well is opened at step (b) during or after the second valve associated with the second well is closed at step (b).

79. Upon information and belief, IWS's Operations Technology practices each of the above limitations of claim 15 of the '779 Patent. For example, upon information and belief, Defendants have employees present on customer's sites to set up, install, and operate IWS's Operations Technology. Upon information and belief, Defendants also use and test IWS's Operations Technology.

80. Additionally, or alternatively, to the extent that any third-parties or end-users (e.g., Defendants' customers/operators) perform one or more of the steps of claim 15, any such action by third parties and/or end-users is attributable to Defendants, such that Defendants are liable for jointly infringing such claim. Upon information and belief, Defendants direct and/or control the other actor(s) by conditioning use of IWS's Operations Technology as well as the receipt of benefits

therefrom, upon proper performance of any such step by any such third party or end user. For example, Defendants exercise and/or direct control over the one or more steps performed by IWS's Operations Technology by exercising sole direction over the entire infringing process (e.g., by controlling participation by such third parties and/or end-users through the use of IWS's Operations Technology as the primary means of manipulating the valves necessary to conduct pumping operations). Further, on information and belief, Defendants condition receipt of the benefit from the use of IWS's Operations Technology, including without limitation, providing continuous pumping operations, upon proper performance of the steps of claim 15 using IWS's Operations Technology. Upon information and belief, Defendants also establish the manner and timing of that performance by such third parties or end users by deploying IWS's Operations Technology as the primary means of manipulating the valves necessary to conduct pumping operations in a manner that performs each of the steps of claim 15. All third-party and/or end-user involvement, if any, is incidental, ancillary, or contractual.

81. Claim 25 of the '779 Patent claims:

> An apparatus adapted to hydraulically fracture first and second wells, the first and second wells being associated with first and second valves, respectively, the apparatus comprising: a non-transitory computer readable medium; and a plurality of instructions stored on the non-transitory computer readable medium and executable by one or more processors, wherein, when the instructions are executed by the one or more processors, the following steps are executed:
>
> > (a) permitting hydraulic fracturing of the second well, comprising: opening the second valve associated with the second well to permit pumping of fluid into the second well via the second valve; and measuring a flow rate of the fluid being pumped into the second well;

> (b) swapping from permitting hydraulic fracturing of the second well to permitting hydraulic fracturing of the first well, comprising: opening the first valve associated with the first well to permit pumping of fluid into the first well via the first valve; and closing the second valve associated with the second well; wherein, during step (b), hydraulic fracturing fluid is continuously pumped to the first and second valves via a hydraulic manifold; and
>
> wherein: in response to determining that the flow rate measured at step (a) has satisfied one or more flow rate conditions, the first valve associated with the first well is opened at step (b) before the second valve associated with the second well is closed at step (b); or in response to determining that the flow rate measured at step (a) has not satisfied one or more flow rate conditions, the first valve associated with the first well is opened at step (b) during or after the second valve associated with the second well is closed at step (b).

82. IWS's Operations Technology also practices each of the above limitations of claim 25 of the '779 Patent. To the extent that Defendants do not directly infringe claim 25, Defendants are nonetheless liable for jointly infringing claim 25 because, for example, for the same reasons set forth above, Defendants direct and/or control other actor(s) such that the infringement is attributable to Defendants.

83. A more detailed analysis of Defendants' infringement of claim 15 and claim 25 of the '779 Patent can be found in Exhibit 10, which is incorporated herein.

84. Defendants' infringement of the '779 Patent has been, and continues to be, willful, knowing, and intentional.

85. Downing has suffered economic harm because of Defendants' infringing activities in an amount to be proven at trial, but in no case less than a reasonable royalty.

86. Defendants have caused, and unless restrained and enjoined, will continue to cause, irreparable injury and damage to Downing for which there is no adequate remedy at law. Unless enjoined by this Court, Defendants will continue to infringe the '779 Patent.

VIII. SECOND CLAIM FOR RELIEF

(Induced Infringement of the '779 Patent)

87. Downing realleges paragraphs 1-73 above as if fully set forth herein.

88. Defendants also knowingly and intentionally induce others to infringe at least claim 15 of the '779 Patent in violation of 35 U.S.C. § 271(b) by instructing and/or aiding others to use IWS's Operations Technology in a manner that infringes one or more claims of the '779 Patent.

89. As described above, Defendants have been aware of the '716 App (which issued as the '779 Patent) since at least June 30, 2022, and of the infringing nature of IWS's Operations Technology.

90. Despite knowledge of the '779 Patent, Defendants continue to actively encourage, instruct, and aid their customers (for example, through product information and instruction materials[8]) to implement and use IWS's Operations Technology in ways that directly infringe the '779 Patent. As described above, IWS's Operations Technology is utilized in connection with hydraulic fracturing operations. Defendants assist and instruct their customers regarding when and how to implement and use IWS's Operations Technology during hydraulic fracturing

[8] *See, e.g.*, https://www.linkedin.com/video/event/urn:li:ugcPost:6978470224329101313/.

operations. Thus, Defendants aid and instruct customers to use IWS's Operations Technology in an infringing manner. Defendants do so knowingly and intending that their customers will commit infringing acts.

91. Defendants also continue to use, rent, offer to rent, sell, offer to sell, and/or otherwise provide IWS's Operations Technology to customers, despite Defendants' knowledge of the '779 Patent, thereby specifically intending for and inducing their customers to infringe the '779 Patent through their customers' normal and customary use of IWS's Operations Technology during hydraulic fracturing operations.

92. Downing has suffered economic harm because of Defendants' induced infringement in an amount to be proven at trial, but in no case less than a reasonable royalty.

93. Defendants have caused, and unless restrained and enjoined, will continue to cause, irreparable injury and damage to Downing for which there is no adequate remedy at law. Unless enjoined by this Court, Defendants will continue to infringe the '779 Patent.

IX. THIRD CLAIM FOR RELIEF

(Direct Infringement of the '770 Patent)

94. Downing realleges paragraphs 1-73 above as if fully set forth herein.

95. The '770 Patent is a valid, enforceable patent that was duly issued by the USPTO on January 24, 2023.

96. Downing is the assignee of the '770 Patent with ownership of all substantial rights in the '770 Patent, including the right to exclude others and to enforce, sue, and recover damages for past and future infringements.

97. Defendants have directly infringed, and continue to directly infringe, at least claims 1 and 14 of the '770 Patent in violation of 35 U.S.C. § 271(a) by, for example and without limitation, using, renting, offering to rent, selling, offering to sell, and/or otherwise providing IWS's Operations Technology.

98. Claim 1 of the '770 Patent claims:

A method, comprising:

> communicating fluid to a first well via a manifold and a first valve, the first valve being associated with both the manifold and the first well; and
>
> in response to determining that the fluid communicated via the manifold has satisfied one or more conditions:
>
> opening a second valve;
>
> communicating fluid to a second well via the second valve; and
>
> closing the first valve after opening the second valve.

99. Upon information and belief, IWS's Operations Technology practices each of the above limitations of claim 1 of the '770 Patent. For example, upon information and belief, Defendants have employees present on customer's sites to set up, install, and operate IWS's Operations Technology. Upon information and belief, Defendants also use and tests IWS's Operations Technology.

100. Additionally, or alternatively, to the extent that any third-parties or end-users (e.g., Defendants' customers/operators) perform one or more of the steps

of claim 1, any such action by third parties and/or end-users is attributable to Defendants, such that Defendants are liable for jointly infringing such claim. Upon information and belief, Defendants direct and/or control the other actor(s) by conditioning use of IWS's Operations Technology as well as the receipt of benefits therefrom, upon proper performance of any such step by any such third party or end user. For example, Defendants exercise and/or direct control over the one or more steps performed by IWS's Operations Technology by exercising sole direction over the entire infringing process (e.g., by controlling participation by such third parties and/or end-users through the use of IWS's Operations Technology as the primary means of manipulating the valves necessary to conduct pumping operations). Further, on information and belief, Defendants condition receipt of the benefit from the use of IWS's Operations Technology, including without limitation, providing continuous pumping operations, upon proper performance of the steps of claim 1 using IWS's Operations Technology. Upon information and belief, Defendants also establish the manner and timing of that performance by such third parties or end users by deploying IWS's Operations Technology as the primary means of manipulating the valves necessary to conduct pumping operations in a manner that performs each of the steps of claim 1. All third-party and/or end-user involvement, if any, is incidental, ancillary, or contractual.

101. Claim 14 of the '770 Patent claims:

An apparatus, comprising:

a non-transitory computer readable medium; and

> a plurality of instructions stored on the non-transitory computer readable medium and executable by one or more processors, wherein, when the instructions are executed by the one or more processors, the following steps are executed:
>
> > communicating fluid to a first well via a manifold and a first valve, the first valve being associated with both the manifold and the first well; and
> >
> > in response to determining that the fluid communicated via the manifold has satisfied one or more conditions:
> >
> > opening a second valve;
> >
> > communicating fluid to a second well via the second valve; and
> >
> > closing the first valve after opening the second valve.

102. IWS's Operations Technology also practices each of the above limitations of claim 14 of the '770 Patent. To the extent that Defendants do not directly infringe claim 14, Defendants are nonetheless liable for jointly infringing claim 14 because, for example, for the same reasons set forth above, Defendants direct and/or control other actor(s) such that the infringement is attributable to Defendants.

103. A more detailed analysis of Defendants' infringement of claims 1 and 14 of the '770 Patent can be found in Exhibit 11, which is incorporated as if set forth herein.

104. Defendants' infringement of the '770 Patent has been, and continues to be, willful, knowing, and intentional.

105. Downing has suffered economic harm because of Defendants' infringing activities in an amount to be proven at trial, but in no case less than a reasonable royalty.

106. Defendants have caused, and unless restrained and enjoined, will continue to cause, irreparable injury and damage to Downing for which there is no adequate remedy at law. Unless enjoined by this Court, Defendants will continue to infringe the '770 Patent.

X. FOURTH CLAIM FOR RELIEF

(Induced Infringement of the '770 Patent)

107. Downing realleges paragraphs 1-73 above as if fully set forth herein.

108. Defendants also knowingly and intentionally induce others to infringe at least claim 1 of the '770 Patent in violation of 35 U.S.C. § 271(b) by instructing and/or aiding others to use IWS's Operations Technology in a manner that infringes one or more claims of the '770 Patent.

109. As described above, Defendants have been aware of the '493 App, which issued as the '770 Patent, since at least January 9, 2023, and of the infringing nature of IWS's Operations Technology.

110. Despite knowledge of the '770 Patent, Defendants continue to actively encourage, aid, and instruct their customers (for example, through product information and instruction materials)[9] to implement and use IWS's Operations Technology in ways that directly infringe the '770 Patent. As described above,

[9] *See, e.g.*, https://www.linkedin.com/video/event/urn:li:ugcPost:6978470224329101313/.

IWS's Operations Technology is utilized in connection with hydraulic fracturing operations. Defendants assist and instruct their customers regarding when and how to implement and use IWS's Operations Technology during hydraulic fracturing operations. Thus, Defendants aid and instruct customers to use IWS's Operations Technology in an infringing manner. Defendants do so knowingly and intending that their customers will commit infringing acts.

111. Defendants also continue to use, rent, offer to rent, sell, offer to sell, and/or otherwise provide IWS's Operations Technology to customers, despite Defendants' knowledge of the '770 Patent, thereby specifically intending for and inducing their customers to infringe the '770 Patent through their customers' normal and customary use of IWS's Operations Technology during hydraulic fracturing operations.

112. Downing has suffered economic harm because of Defendants' induced infringement in an amount to be proven at trial, but in no case less than a reasonable royalty.

113. Defendants have caused, and unless restrained and enjoined, will continue to cause, irreparable injury and damage to Downing for which there is no adequate remedy at law. Unless enjoined by this Court, Defendants will continue to infringe the '770 Patent.

XI. PRAYER FOR RELIEF

WHEREFORE, Downing requests entry of judgment in its favor and against Defendants as follows:

1. Entry of judgment holding Defendants liable for infringement of the Asserted Patents;

2. An order permanently enjoining Defendants, their officers, agents, servants, employees, attorneys and affiliated companies, their assigns and successors in interest, and those persons in active concert or participation with them, from continued acts of infringement of the Asserted Patents;

3. An order awarding Downing statutory damages and damages according to proof resulting from Defendants' past, current, and future infringement of the Asserted Patents, together with prejudgment and post-judgment interest;

4. A declaration that Defendants' infringement of the Asserted Patents is willful;

5. A declaration that this case is exceptional under 35 U.S.C. § 285, and an award of Downing's reasonable attorneys' fees; and

6. Any and all other legal or equitable relief as may be available under law and which the Court may deem proper.

XII. JURY DEMAND

Downing hereby demands trial by jury in this action on all issues so triable.

Dated: August 7, 2023

Respectfully submitted,

/s Lee F. Johnston

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ATTORNEYS FOR PLAINTIFF DOWNING WELLHEAD EQUIPMENT, LLC

CERTIFICATE OF SERVICE

I hereby certify that on August 7, 2023, a true and correct copy of the foregoing document has been served via the Court's ECF system to all counsel of record:

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