

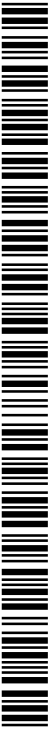


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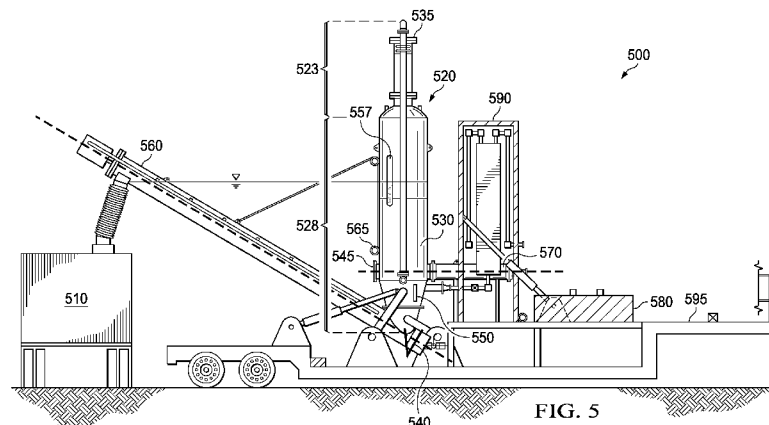
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(54) Title: BACKFLOW COLLECTION SYSTEM AND METHOD FOR RECLAIMING THE SAME



(57) Abstract: The present disclosure provides a backflow collection system and a method for reclaiming backflow from a wellbore. The backflow collection system, in one embodiment, includes a collection vessel having an upper section and a lower section, the collection vessel having a side opening configured to receive backflow from an oil/gas well, as well as a discharge port proximate an upper end of the upper section configured to discharge pressurized gas from the collection vessel. The backflow collection system, in this embodiment, further includes an auger coupled proximate the lower section of the collection vessel, the auger configured to receive solid and liquid matter from a bottom opening in the lower section of the collection vessel, and when elevated remove at least a portion of the solid and liquid matter from the collection vessel, the collection vessel designed such that when fluid is contained therein it acts as a liquid/gas seal to prevent the pressurized gas from exiting through the bottom opening in the lower section of the collection vessel.

**BACKFLOW COLLECTION SYSTEM AND METHOD FOR
RECLAIMING THE SAME**

5 **CROSS-REFERENCE TO RELATED APPLICATION**

This Application is a continuation-in-Part of U.S. Application No. 12/685,549 filed on January 11, 2010 entitled "BACKFLOW COLLECTION RECEPTACLE AND METHOD FOR RECLAIMING THE SAME" to Bruce Thompson which claims the benefit of
10 Provisional Application Serial No. 61/143,693 entitled "Gas Buster/Sand Auger" to Bruce Thompson, filed on January 9, 2009, as well as Provisional Application Serial No. 61/583,499 entitled "Oil Super Loop" to Bruce Thompson, filed on January 5, 2012, all of which are commonly assigned with the present
15 disclosure and incorporated herein by reference as if reproduced herein in its entirety.

TECHNICAL FIELD

The present disclosure is directed, in general to a
20 receptacle and more specifically, to a backflow collection receptacle and method for using the same.

BACKGROUND

Production of oil and gas (e.g., hydrocarbons) from subterranean formations is dependent on many factors. These hydrocarbons must usually migrate through a low permeable formation matrix to drain into the wellbore. In many formations, the permeability is so low that it hinders the well's production rate and overall potential. In other wells, the near wellbore is damaged during drilling operations and such damage often results in less than desirable well productivity. Hydraulic fracturing is a process designed to enhance the productivity of oil and gas wells or to improve the injectivity of injection wells.

In the fracturing process, a viscous fluid is injected into the wellbore at such a rate and pressure as to induce a crack or fracture in the formation. Once the fracture is initiated, a propping agent, such as sand (e.g., often referred to as "frac" sand), is added to the fluid just prior to entering the wellbore. This sand laden slurry is continuously injected causing the fracture to propagate or extend. After the desired amount of proppant has been placed in the reservoir, pumping is terminated, and the well is shut-in for some period of time.

After the pressure is released from the wellbore, the sand, or at least a significant portion of the sand, remains within the fractured strata thereby holding the strata in a substantially fractured state. Accordingly, the oil and gas is allowed to flow freely. Unfortunately, as the oil and gas begin to flow it starts to push other unwanted fluids and gasses, as well as some unwanted particulates from the strata (including, frac sand, salts, etc.) back to the surface.

A problem arises in how to deal with these unwanted fluids, gases and particulates. One gas byproduct of the fracking process of particular concern is hydrogen sulfide. Hydrogen sulfide is the chemical compound with the formula H_2S . Hydrogen sulfide is a colorless, very poisonous, flammable gas with the characteristic foul odor of rotten eggs. As hydrogen sulfide is extremely poisonous, and is often odorless in small concentrations, it is a significant concern during the collection of the unwanted fluid and particulates that backflow from the wellbore.

Accordingly, what is needed in the art is apparatus, and/or associated process, which addresses the aforementioned problems.

SUMMARY

To address the above-discussed deficiencies of the prior art, the present disclosure provides a backflow collection system. The backflow collection system, in one embodiment, 5 includes a collection vessel having an upper section and a lower section, the collection vessel having a side opening configured to receive backflow from an oil/gas well, as well as a discharge port proximate an upper end of the upper section configured to discharge pressurized gas from the 10 collection vessel. The backflow collection system, in this embodiment, further includes an auger coupled proximate the lower section of the collection vessel, the auger configured to receive solid and liquid matter from a bottom opening in the lower section of the collection vessel, and when elevated 15 remove at least a portion of the solid and liquid matter from the collection vessel, the collection vessel designed such that when fluid is contained therein it acts as a liquid/gas seal to prevent the pressurized gas from exiting through the bottom opening in the lower section of the collection vessel.

20 Further provided is a method for reclaiming backflow from a wellbore. The method, in one embodiment, includes collecting solid and liquid matter from a wellbore within a backflow collection system, the backflow collection system

being similar to the backflow collection system of the paragraph above. The method further includes operating the auger in a manner configured to remove at least a portion of the solid matter from the collection vessel while burning the
5 pressurized gas exiting the discharge port.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present disclosure, reference is now made to the following
10 descriptions taken in conjunction with the accompanying drawings, in which:

Fig. 1 illustrates a collection receptacle in accordance with the disclosure;

Figs. 2A thru 2E illustrate various views of an elevated
15 auger including a housing and a flighting;

Fig. 3 illustrates an alternative embodiment of an elevated auger;

Fig. 4 illustrates yet another alternative embodiment of an elevated auger; and

20 Figs. 5-7 illustrate various different views of a backflow collection system manufactured and operated in accordance with this disclosure.

DETAILED DESCRIPTION

Referring initially to Fig. 1, illustrated is a collection receptacle 100 in accordance with the principles of the disclosure. The collection receptacle 100, as those skilled in the art appreciate, may be used to collect any number of different types of matter, including solid matter, liquid matter or a combination thereof. In one particular embodiment, the collection receptacle is configured to reclaim, including collecting and dispensing, backflow from a wellbore. For instance, the collection receptacle could be configured to reclaim fluid, hydrocarbons, frac sand, salts, etc., that would backflow from a wellbore after fracturing an oil and gas strata.

The collection receptacle 100 of Fig. 1 includes an enclosure 110. The enclosure 110, in this embodiment, is configured to collect solid and liquid matter. Moreover, the enclosure 110 of Fig. 1 includes a first portion 120 and a second portion 130. The first portion 120, in this embodiment, is configured to initially collect the solid and liquid matter. However, in this embodiment, the first portion 120 has an opening 125 (e.g., weir) in an upper region thereof. The opening 125, in one embodiment, is configured to allow excess collected liquid matter to overflow into the

second portion 130 as the collected solid matter falls to a bottom of the first portion 120.

In one embodiment, the first portion additionally includes an emergency opening 127 configured to quickly divert
5 extreme amounts of collected solid and liquid matter to the second portion 130. The purpose of the emergency opening 127, in this embodiment, is to prevent overflow of the collected liquid and/or solid matter from the enclosure 110 in the event the opening 125 cannot handle the volume of the incoming solid
10 and liquid matter. As the emergency opening 127 is traditionally only used in extreme circumstances, the positioning of the emergency opening 127 is above the positioning of the opening 125. Accordingly, the emergency opening, in this embodiment, will only be employed in extreme
15 circumstances. In the embodiment of Fig. 1, the opening 125 is located at the rear of the first portion 120, and the emergency opening 127 is located along the sides of the first portion 120. Nevertheless, the size, shape and location of each of the opening 125 and emergency opening 127 may be
20 tailored on a use-by-use basis.

Located within the enclosure 110, and in this example the first portion 120, are one or more baffles 140. The baffles

140, in one example, are used to help direct the solid matter to the bottom of the first portion 120, among other uses.

The collection receptacle 100 further includes an elevated auger 150 extending into the enclosure 110, and more particularly the first portion 120 of the embodiment of Fig. 1. The auger 150, as would be expected, is configured to remove one or more contents from the enclosure 110. Nevertheless, in contrast to well known augers, the auger 150 is configured in such a way as to promote the separation of the solid matter from the liquid matter located within the enclosure 110, for example as the solid matter travels up the auger 150 and out of the enclosure 110. Specifically, the auger 150 of Fig. 1 includes a housing and a flighting, and in this embodiment the housing and flighting are configured in a manner to promote the aforementioned separation.

Turning briefly to Figs. 2A thru 2D, illustrated are various views of an elevated auger 200 including a housing 210 and a flighting 220. Fig. 2A illustrates a cutaway view of the auger 200, whereas Fig. 2B illustrates the flighting 220, Fig. 2C illustrates a cross-section of the housing 210 taken through line C-C, and Fig. 2D illustrates a cross-section of the housing 210 taken through line D-D. In referring to the embodiment of Figs. 2A thru 2D, the housing 210 has a radius

r_h and the flighting 220 has a lesser radius r_f , the difference in radius configured to promote separation of the solid matter from the liquid matter. Because of this lesser radius r_f of the flighting 220, the auger 200 creates a solid matter tube surrounding the flighting 220 as the solid matter is removed from the enclosure. The term solid matter tube, as used herein, is intended to reference a tube like feature using the solid matter itself as the tube, as opposed to other rigid materials such as steel, iron, etc. The solid matter tube, a sand or mud tube in one example, provides a porous means for the liquid matter to travel back down the auger 200 as the solid matter travels up the auger 200. Likewise, as the solid matter travels up the auger 200 it is squeezed by the pressure of the solid matter tube against the flighting 220, thus further promoting the separation of the liquid matter.

The degree of difference between the housing radius r_h and the flighting radius r_f can be important to the ability of the auger 200 to promote separation. For instance, in one embodiment r_f is less than about 90 percent of r_h . In yet another embodiment, r_f is less than about 75 percent of r_h , and in yet another embodiment, r_f is less than about 67 percent of r_h . For example, in the embodiment of Figs. 2A thru 2D, r_f

ranges from about 5 inches to about 7 inches, whereas r_h ranges from about 8 to about 9 inches.

It has been acknowledged that certain configurations of the auger 150 experience issues with the solid matter tube caving in, or sliding back down to the bottom of the first portion 120. This is particularly evident when the spacing between the flighting and the housing are large. This is also particularly evident in the embodiment wherein the centerline of the housing and centerline of the flighting do not coincide. Based upon this acknowledgment, and substantial experimentation, it has been recognized that blocks 155 (Fig. 1) may be placed between the flighting and housing at various positions along the length thereof. The blocks 155, in this embodiment, typically extend from the inside wall of the housing toward the flighting, and in doing so help reduce the likelihood of the solid matter tube caving in. The blocks 155, in one embodiment, typically extend from the upper most inner surface of the housing toward the flighting, are located at one to six different locations, and are not required between the lower most inner surface of the housing and the flighting. Other configurations, beyond those just disclosed, might also be used.

Turning now specifically to Fig. 2B, illustrated is the
flighting 220. The flighting 220, as shown, includes a radius
 r_f . Likewise, a shaft 230 of the flighting 220 includes a
radius r_s . To further promote the separation of the liquid
5 matter from the solid matter, for example by way of increased
pressing on the solid matter, the "teeth" 240 of the flighting
220 extend only a little way from the shaft. For example, in
one embodiment, r_s should be at least about 50 percent of r_f .
In an alternative embodiment, r_s should be at least about 65
10 percent of r_f , if not at least about 80 percent of r_f . For
example, in the embodiment of Fig. 2B, r_s ranges from about 3
inches to about 4 inches, whereas r_f ranges from about 5
inches to about 7 inches. To further promote separation, the
teeth 240 may include notches therein, for example notches
15 extending into the teeth 240 about .25 inches to about 1 inch.

Turning now specifically to Figs. 2C and 2D, illustrated
are the cross-sections of the housing 210. As is illustrated
in Fig. 2C, this portion of the housing 210 has a u-shaped
trough cross-section. In contrast, as is illustrated in Fig.
20 2D, this portion of the housing 210 has a flare-shaped trough
cross-section. Nevertheless, other cross-sections could be
used.

Turning briefly to Fig. 2E, illustrated is an alternative cross-sectional shape for the housing 210. In this embodiment, as shown, the housing 210 may have a circular cross-section. In this embodiment, the circular cross-section might have a radius ranging from about 8 to about 10 inches, and more particularly about 9 inches. As the radius of the flighting (r_f) is less than the radius of the circular cross-section of the housing 210, in this embodiment r_f ranging from about 5 to about 7 inches, a solid matter tube will likely form. It should be noted that in certain embodiments a centerline of the flighting will coincide with a centerline of the circular housing 210. In other embodiments, however, the centerlines will not coincide. For example, in one known embodiment the centerline of the flighting will be closer to a bottom surface of the housing 210 than an upper surface of the housing 210. In this embodiment, the distance between the flighting and the bottom surface of the housing 210 will be less than a distance between the flighting and the top surface of the housing 210.

Turning now to Fig. 3, illustrated is an alternative embodiment of an elevated auger 300. The auger 300 of Fig. 3, in contrast to the degree of difference between the housing radius r_h and the flighting radius r_f , includes a drain shoot

315 extending along a bottom surface of a housing 310 thereof. The drain shoot, regardless of the shape thereof, provides a pathway for excess fluid to travel back down the auger 300 as the solid matter travels up the auger 300. Accordingly, in
5 this embodiment the housing 310 and the flighting 320 may have a somewhat similar overall shape and radius, but the added drain shoot 315 promotes the separation of the solid matter from the liquid matter. Accordingly, excess liquid matter squeezed from the solid matter travels down the drain shoot
10 315 as the solid matter travels up the auger 300.

Turning now to Fig. 4, illustrated is an alternative embodiment of an elevated auger 400. The auger 400 of Fig. 4, in contrast to the degree of difference between the housing radius r_h and the flighting radius r_f , includes a housing 410
15 having a first portion 413 and a second portion 418 and surrounding a flighting 420. In this embodiment, the first portion 413 is located between the second portion 418 and the flighting 420, and furthermore is perforated to promote the separation of the solid matter from the liquid matter.
20 Accordingly, excess liquid matter squeezed from the solid matter exits the first portion 413 through the perforations therein, and then travels back down the auger 400 between the

space separating the first and second portions 413, 418, respectfully.

Returning back to Fig. 1, the auger 150 includes a gate 160 at a bottom portion thereof. The gate 160, in this embodiment, is configured to allow solid matter to exit the auger 150 when operated in reverse. For example, certain situations may exist wherein solid matter remains within the enclosure 110, but there is a desire to fully empty the auger 150 of any solid matter. In this situation, the auger 150 could be operated in reverse, thereby emptying the auger 150 of any solid matter. The gate 160, in this example, allows the auger 150 to rid itself of solid matter without putting undue stress or torque on the auger 150 and/or its motor. Accordingly, the gate 160 may be opened when the auger 150 is run in reverse, and any solid matter within the auger 150 will be efficiently removed therefrom. In the embodiment shown, the solid matter exits into the second portion 130 of the enclosure 110.

The collection receptacle 100 of Fig. 1 further includes a gas buster 170 located between the enclosure 110 and a wellbore. The gas buster 170, as expected, is configured to dissipate energy associated with incoming solid and liquid matter. In the embodiment of Fig. 1, the gas buster 170 is

coupled to an upper portion of the enclosure 110, for example near a rear thereof. The collection receptacle 100 of Fig. 1 further includes one or more wheels 180 coupled to the enclosure 110. The wheels 180 are configured to allow the
5 collection receptacle 100 to roll from one location to another. Likewise, the auger 150 may include one or more inspection ports 190, for example with hinged covers,

A collection receptacle, such as the collection receptacle 100 of Fig. 1, may be used for reclaiming backflow
10 from a wellbore. In one embodiment, solid and liquid matter originally enters the first portion 120 of the enclosure 110 through the gas buster 170. As the solid matter sinks to the bottom of the first portion 120, the liquid matter (e.g., the water, salts, and hydrocarbons) float to the top. As the
15 solid and liquid matter continue to fill the first portion 120 of the enclosure 110, the liquid matter begins to flow through the opening 125 designed therein, to the second portion 130 of the enclosure 110. Once the solid matter approaches the top of the first portion 120 where the opening 125 exists, the
20 first portion 120 will be substantially full of solid matter, while the second portion 130 of the enclosure 110 will primarily contain the liquid matter.

In certain embodiments, it is important that the revolutions per minute (rpm) of the flighting within the housing is slow enough to remove the solid matter from the enclosure, while allowing the liquid matter to be adequately removed there from. Accordingly, in direct contrast to traditional auger systems, the rpm of the flighting is intentionally kept slow. For example, in one embodiment the flighting has an rpm of about 15 or less. In other embodiments, an rpm of 12 or less provides advantageous results. In yet another embodiment, an rpm of 8 or less, and more particularly between about 4 and 8, provides superior results.

In this scenario, the liquid matter can be easily removed from the first portion 120 of the enclosure 110 without further contaminating the solid matter. The solid matter that exits the top of the auger 150 tends to be only slightly damp.

Moreover, it is believed that this solid matter need not be decontaminated or reconditioned before being reused or introduced into the environment. Accordingly, the expense associated with this decontamination or reconditioning may be spared.

Turning to Fig. 5, illustrated is a backflow collection system 500 manufactured in accordance with the disclosure.

The backflow collection system 500 includes a collection receptacle 510. The collection receptacle 510 is similar, in many ways to the collection receptacle 100 illustrated and discussed above. Accordingly, no further discussion is
5 needed.

The backflow collection system 500 further includes a collection vessel 520 coupled to an auger 560. The collection vessel 520, in the illustrated embodiment, is configured as a vertical collection vessel. Such a configuration may be used
10 to further help separate the solid and liquid matter from the gasses. The collection vessel 520, in one embodiment, includes an upper section 523 and a lower section 528. The lower section 528, in this embodiment, includes a side opening 530, while the upper section includes a discharge port 535.
15 The side opening 530, in this embodiment, is configured to receive backflow from an oil/gas well. For example, the side opening 530 might comprise a pipe and flange configured to couple to an oil/gas well and receive backflow therefrom. The side opening 530 may be positioned at various different
20 heights along the collection vessel 520. If the side opening 530 is positioned to near the bottom of the collection vessel 520, solid matter entering the collection vessel 520 may plug the side opening 530. In contrast, if the side opening 530 is

positioned to near the top of the collection vessel 520, solid and liquid matter entering the collection vessel 520 may be pushed out the discharge port 535. The discharge port 535, in the illustrated embodiment, is configured to discharge 5 pressurized gas received from the backflow from the oil/gas well from the collection vessel. One particular gas that may be discharged, and burned as it exits the discharge port 535, is hydrogen sulfide.

The auger 560, in the illustrated embodiment, is coupled 10 proximate the lower section 528 of the collection vessel 520.

The auger 560, in this embodiment, is configured to receive the solid and liquid matter from a bottom opening 540 in the lower section 528 of the collection vessel 520. When the auger 560 is elevated, and turned on, the auger 560 is 15 configured to remove at least a portion of the solid and liquid matter from the collection vessel 520 while allowing the gasses to remain within the collection vessel 520, or alternatively exit the discharge port 535 in the upper end of the upper section 523 of the collection vessel 520. The auger 20 may include a hoist 565, for example an electric hoist, to raise and lower the auger 560.

Bottom walls of the lower section 528 of collection vessel 520 may be slanted (e.g., from vertical) to assist the

solid matter in exiting the bottom opening 540 into the auger 560. For example, the bottom walls of the lower section 528 might slant at an angle of at least about 45 degrees from vertical. In an alternative embodiment, bottom walls of the lower section 528 might slant at an angle of at least about 70 degrees from vertical.

A vibration mechanism 550 may be coupled to at least one of the collection vessel 520 or the auger 560. The term "vibration mechanism", as used herein, encompasses any device capable of providing vibrations to the collection vessel 520 in such a way as to assist the solid material from exiting the collection vessel 520 and entering the auger 560. The vibration mechanism 550, in this embodiment, is configured to assist the auger 560 receive solid matter from the bottom opening 540 in the lower section 528 of the collection vessel 520. In the illustrated embodiment, the vibration mechanism 550 is coupled to the lower section 528 of the collection vessel 520. Nevertheless, the vibration mechanism 550 could also be coupled to the auger 560. Any type of vibration mechanism 550, including pneumatic and electric based vibration mechanisms, are within the scope of the present disclosure.

The collection vessel 520 further includes abrasion plate 545 located on an opposing side of the collection vessel 520 as the side opening 530. The abrasion plate 545 is configured to receive the brunt of the abrasion/force of the solid and liquid matter as it enters the collection vessel 520. The abrasion plate 545 is an additional feature added to a typical collection vessel. In one embodiment, the abrasion plate 545 is replaceable. For example, a second side opening could be included within the collection vessel, the second side opening directly opposing the side opening 530. In this embodiment, the abrasion place 545 could be attached to the second side opening. Accordingly, the abrasion place could be easily replaced when needed. The collection vessel 520 may additionally include a sight liquid level indicator 557.

The backflow collection system 500 may further include a gas buster 570. The gas buster 570, in this embodiment, is configured to reduce a velocity of the solid and liquid matter exiting the oil/gas well and entering the collection vessel 520. The gas buster 570, in the illustrated embodiment, couples directed to a flange associated with the side opening 530 in the collection vessel 520. Other embodiments exist wherein the gas buster 570 is not directly coupled to the

collection vessel 520, but is located more near the oil/gas well.

Turning briefly to Fig. 6, illustrated is an enlarged view of the gas buster 570 of Fig. 5. In the illustrated embodiment, the gas buster 570 includes a first section 610 and a second section 620. The first section 610, in this embodiment, includes a first cross-sectional area that is less than a second cross-sectional area of the second section 620.

The increasing cross-sectional area of the gas buster 570 (e.g., as it approaches the collection vessel 520) is configured to reduce the velocity of the solid and liquid matter exiting the oil/gas well and entering the collection vessel 520. While the gas buster 570 only includes two steps in cross-sectional value, other embodiments may exist wherein three or more steps are used.

The gas buster 570, in the illustrated embodiment, further includes a first smaller pipe 630 that is encompassed by a second larger pipe 640. The first smaller pipe 630, in the illustrated embodiment, includes a plurality of openings 635 spaced along a length thereof. In fact, in the embodiment of Fig. 6, the openings 635 are sequentially spaced and rotated along the length of the first smaller pipe 630.

Returning to Fig. 5, the backflow collection system 500, in the illustrated embodiment, further includes a choke manifold 580 positioned between the side opening 530 in the collection vessel 520 and the oil/gas well. The choke manifold 580, in this embodiment, is configured to reduce a volume of the solid and liquid matter exiting the oil/gas well and entering the collection vessel 520. Those skilled in the art understand the various different choke manifolds 580 that might be used and remain within the purview of the present disclosure.

The backflow collection system 500, in the illustrated embodiment, may further include a high pressure sand trap 590 positioned between the side opening 530 in the collection vessel 520 and the oil/gas well. The high pressure sand trap 590, in this embodiment, is configured to remove a portion of the solid matter exiting the oil/gas well prior to entering the collection vessel 520. Those skilled in the art understand the various different high pressure sand traps 590 that might be used and remain within the purview of the present disclosure.

In the illustrated embodiment of Fig. 5, the collection vessel 520 and the auger 560 are position on a movable trailer 595. Further to the embodiment of Fig. 5, the gas buster 570,

the choke manifold 580 and the high pressure sand trap 590 are also located on the movable trailer 595. In the illustrated embodiment, each of the collection vessel 520, auger 560, gas buster 570, choke manifold 580 and high pressure sand trap 590 are configured to transition from an operational positions to transit positions on the movable trailer.

With brief reference to Fig. 7, illustrated are the collection vessel 520, auger 560, gas buster 570, choke manifold 580 and high pressure sand trap 590 in their transit positions. As illustrated, the collection vessel 520, auger 560, gas buster 570, choke manifold 580 and high pressure sand trap 590 may pivot to transition from the operational position to the transit position. Other mechanisms, however, could also be used to help the collection vessel 520, auger 560, gas buster 570, choke manifold 580 and high pressure sand trap 590 transition from the operational position to the transit position.

A backflow collection system, such as the backflow collection system of Figs. 5-7, may be used to reclaim backflow from a wellbore. This process may begin by collecting solid and liquid matter from the wellbore using the backflow collection system. As the solid and liquid matter, as well as the gasses, enter the collection vessel, the auger

may be operated in a manner to remove at least a portion of the solid matter from the collection vessel, while at the same time pressurized gas exiting the discharge port is burned.

Although the present disclosure has been described in
5 detail, those skilled in the art should understand that they can make various changes, substitutions and alterations herein without departing from the spirit and scope of the disclosure in its broadest form.

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WHAT IS CLAIMED IS:

1. A backflow collection system, comprising:

a collection vessel having an upper section and a lower section, the collection vessel having a side opening
5 configured to receive backflow from an oil/gas well, as well as a discharge port proximate an upper end of the upper section configured to discharge pressurized gas from the collection vessel; and

an auger coupled proximate the lower section of the
10 collection vessel, the auger configured to receive solid and liquid matter from a bottom opening in the lower section of the collection vessel, and when elevated remove at least a portion of the solid and liquid matter from the collection vessel, the collection vessel designed such that when fluid is
15 contained therein it acts as a liquid/gas seal to prevent the pressurized gas from exiting through the bottom opening in the lower section of the collection vessel.

2. The backflow collection system of Claim 1, wherein
20 bottom walls of the lower section slant toward the bottom opening.

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3. The backflow collection system of Claim 2, wherein the bottom walls slant at an angle of at least about 45 degrees from vertical.

5 4. The backflow collection system of Claim 2, wherein the bottom walls slant at an angle of at least about 70 degrees from vertical.

10 5. The backflow collection system of Claim 1, further including a vibration mechanism coupled to at least one of the collection vessel or auger, the vibration mechanism configured to assist the auger to receive solid matter from the bottom opening in the lower section of the collection vessel.

15 6. The backflow collection system of Claim 5, wherein the vibration mechanism is coupled to the lower section of the collection vessel.

20 7. The backflow collection system of Claim 1, further including a replaceable abrasion plate on an opposing side of the collection vessel as the side opening.

8. The backflow collection system of Claim 1, further including a gas buster positioned between the side opening in the collection vessel and the oil/gas well, the gas buster configured to reduce a velocity of the solid and liquid matter exiting the oil/gas well and entering the collection vessel.

9. The backflow collection system of Claim 8, wherein the gas buster couples directly to a flange associated with the side opening in the collection vessel.

10

10. The backflow collection system of Claim 8, wherein a cross-sectional area of the gas buster steps from a smaller value to a larger value as the gas buster approaches the collection vessel, the increasing cross-sectional area configured to reduce the velocity of the solid and liquid matter exiting the oil/gas well and entering the collection vessel.

11. The backflow collection system of Claim 8, wherein the gas buster comprises a first smaller pipe having openings spaced along a length thereof, and a second larger pipe encompassing the first smaller pipe.

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12. The backflow collection system of Claim 1, further including a choke manifold positioned between the side opening in the collection vessel and the oil/gas well, the choke manifold configured to reduce a volume of the solid and liquid matter exiting the oil/gas well and entering the collection vessel.

13. The backflow collection system of Claim 1, further including a high pressure sand trap positioned between the side opening in the collection vessel and the oil/gas well, the high pressure sand trap configured to remove a portion of the solid matter exiting the oil/gas well prior to entering the collection vessel.

14. The backflow collection system of Claim 1, wherein the collection vessel is a vertical collection vessel.

15. The backflow collection system of Claim 1, wherein the collection vessel and auger are positioned on a movable trailer.

16. The backflow collection system of Claim 15, wherein the collection vessel and auger are configured to transition

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from operational positions to transit positions on the movable trailer.

17. The backflow collection system of Claim 16, wherein
5 the collection vessel and auger are configured to pivot to transition from the operational position to the transit position on the movable trailer.

18. The backflow collection system of Claim 1, further
10 including a collection receptacle, the collection receptacle including:

an enclosure configured to collect the solid and liquid matter from the auger; and

an elevated auger extending into the enclosure and
15 configured to remove the solid matter from the enclosure, wherein the auger includes a housing and a flighting, the housing and flighting configured in such a way as to promote separation of the solid matter from the liquid matter as the solid matter travels up the auger and out of the enclosure.

20

19. The backflow collection system of Claim 18, wherein the housing has a radius of r_h and the flighting has a lesser radius of r_f , wherein r_f is less than about 90 percent of r_h .

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20. A method for reclaiming backflow from a wellbore, comprising:

collecting solid and liquid matter from a wellbore within a backflow collection system, the backflow collection system
5 including;

a collection vessel having an upper section and a lower section, the collection vessel having a side opening configured to receive backflow from an oil/gas well, as well as a discharge port proximate an upper end of the upper
10 section configured to discharge pressurized gas from the collection vessel; and

an auger coupled proximate the lower section of the collection vessel, the auger configured to receive solid and liquid matter from a bottom opening in the lower section of
15 the collection vessel, and when elevated remove at least a portion of the solid and liquid matter from the collection vessel, the collection vessel designed such that when fluid is contained therein it acts as a liquid/gas seal to prevent the pressurized gas from exiting through the bottom opening in the
20 lower section of the collection vessel.; and

operating the auger in a manner configured to remove at least a portion of the solid matter from the collection vessel while burning the pressurized gas exiting the discharge port.

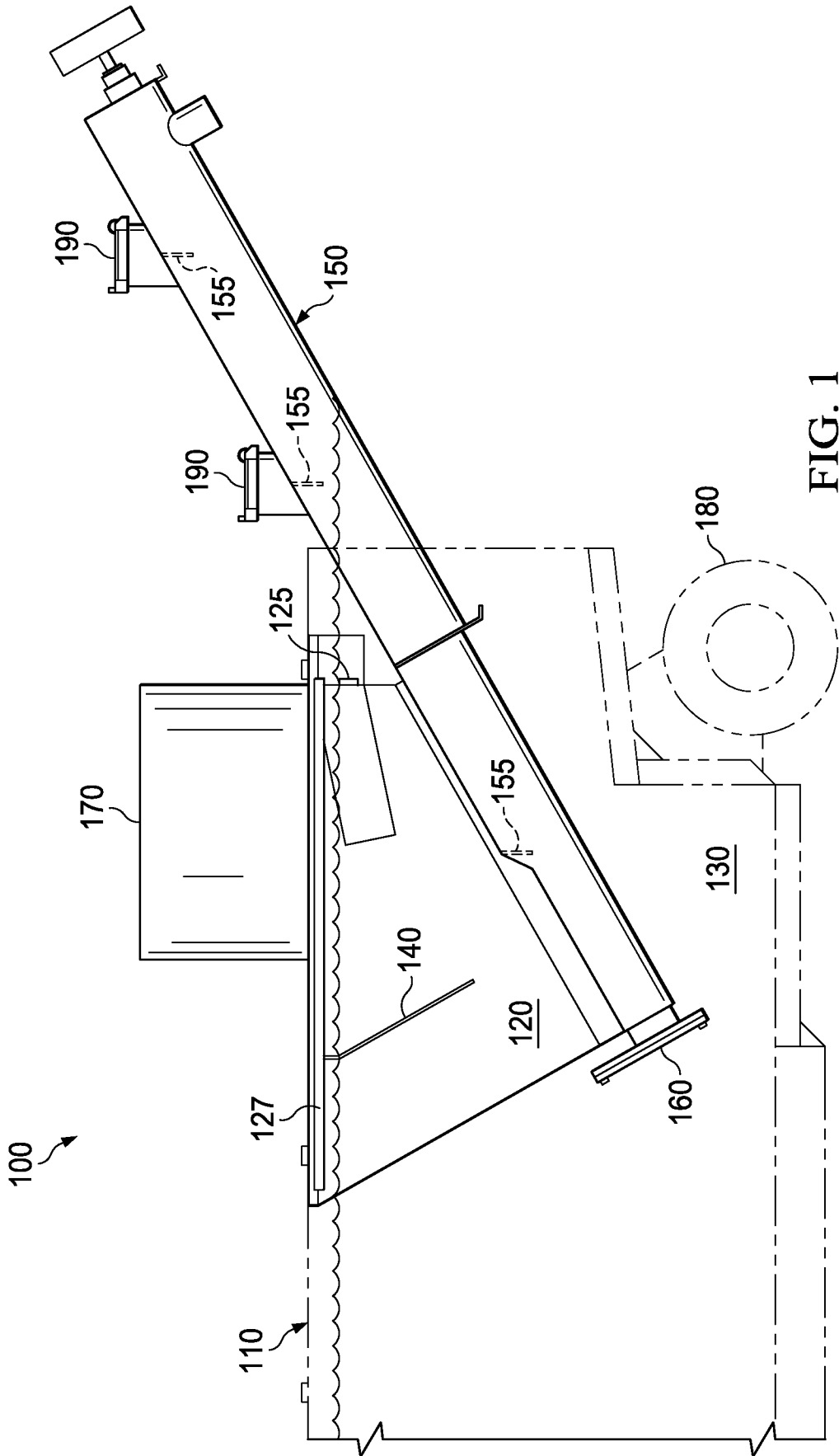


FIG. 1

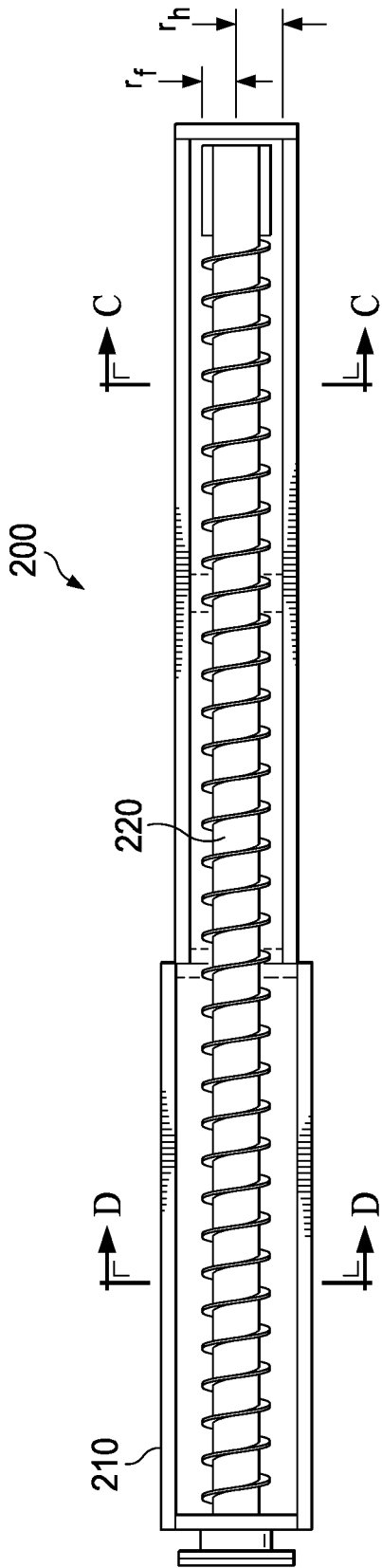


FIG. 2A

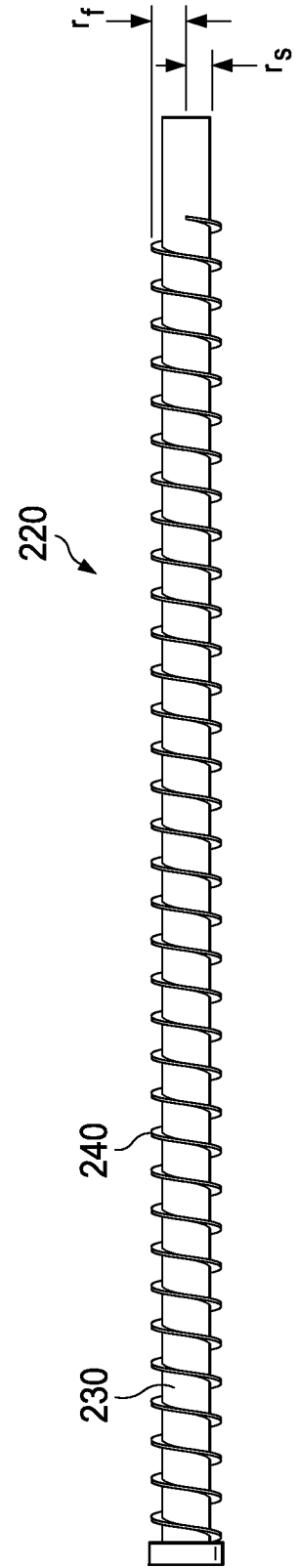


FIG. 2B

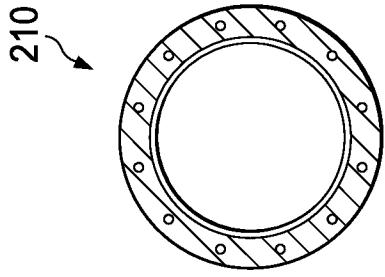


FIG. 2E

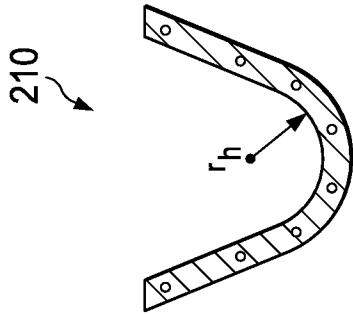


FIG. 2D

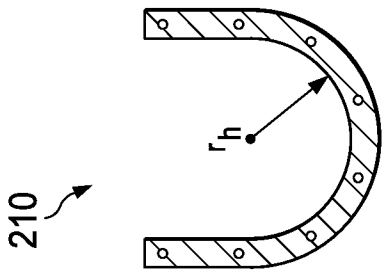


FIG. 2C

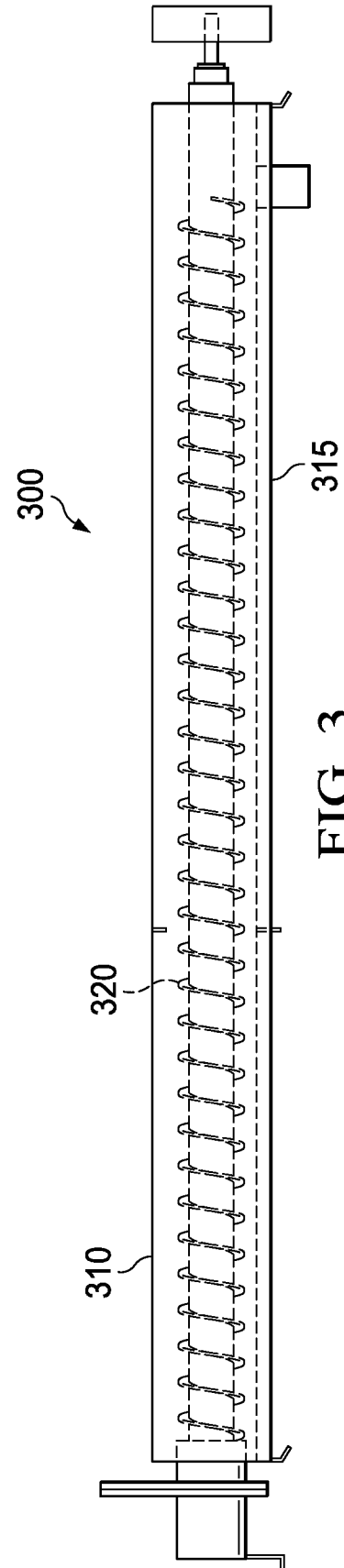


FIG. 3

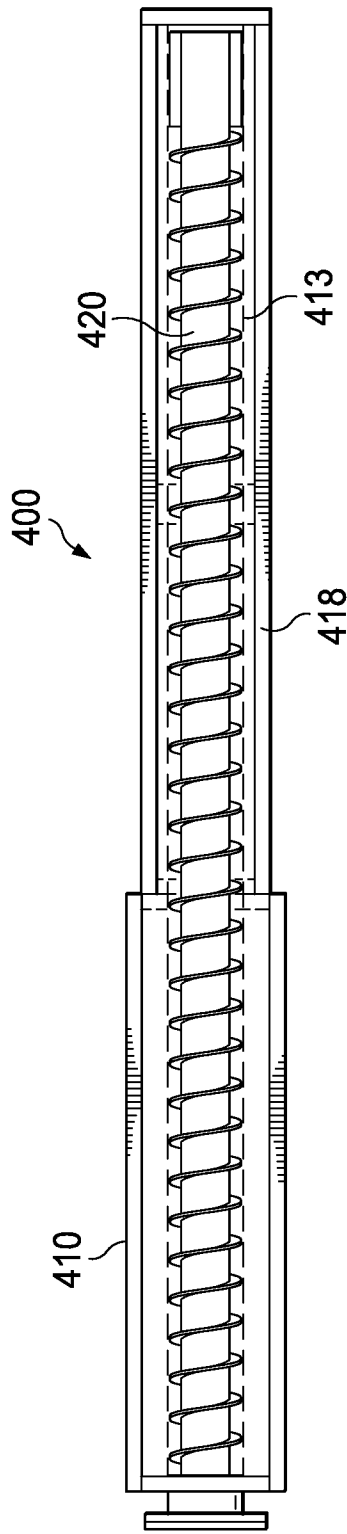


FIG. 4

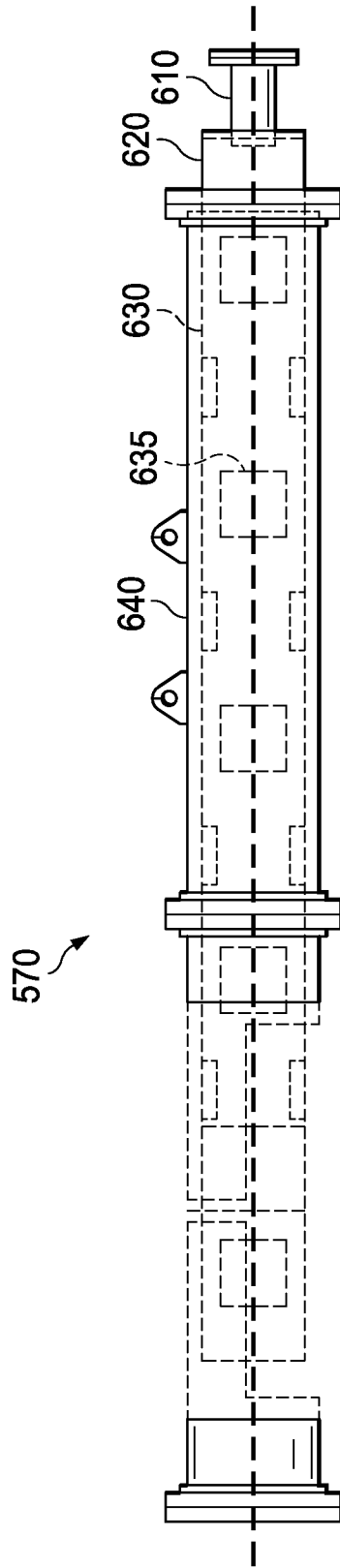


FIG. 6

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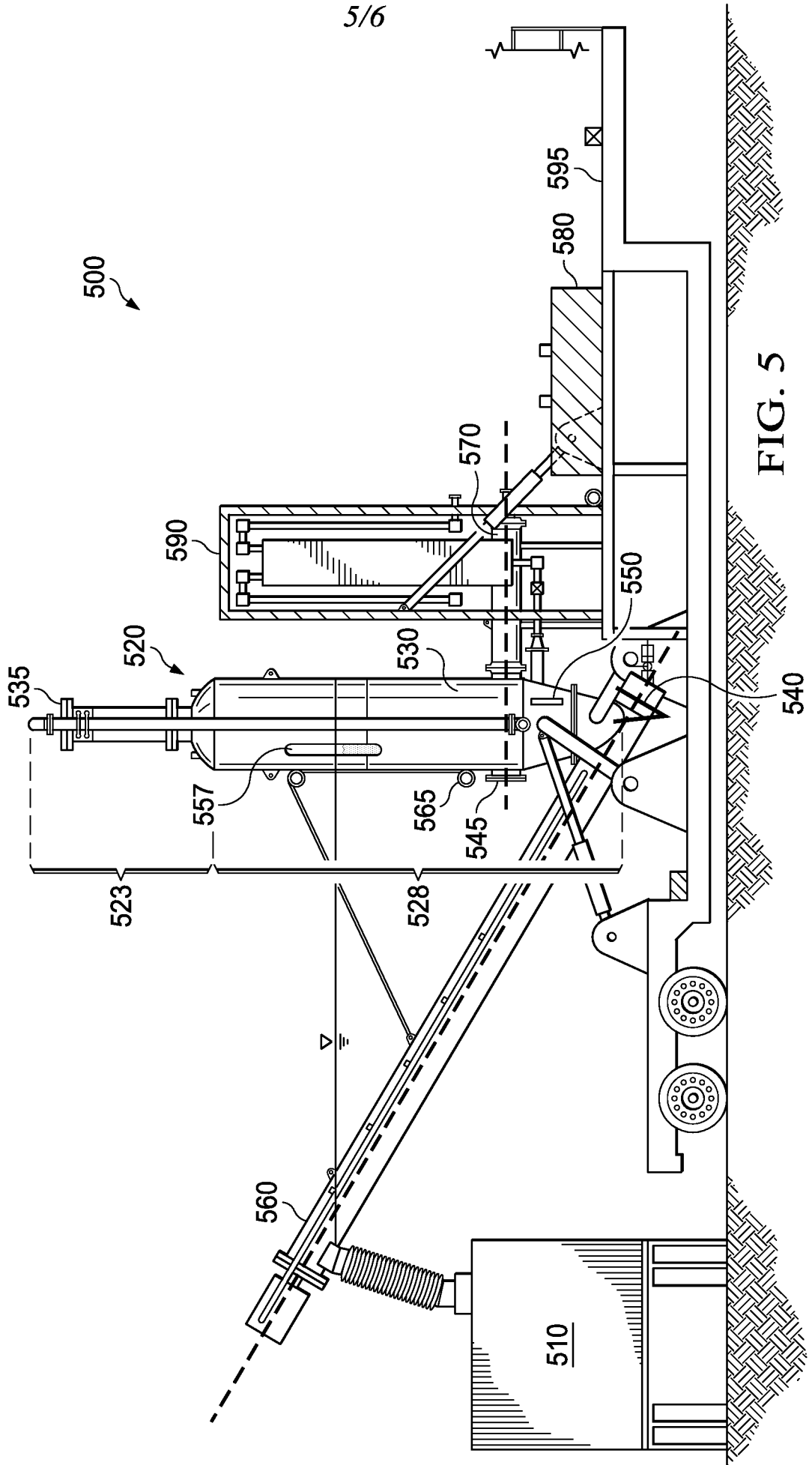


FIG. 5

