CLAIMS

WE CLAIM:

1. A valve, comprising:

a housing;

a stem supported by the housing;

a valve member coupled to the stem and having a first passage defined therein with a metering flow profile.

2. The valve of claim 1, wherein the valve member comprises a gate.

3. The valve of claim 2, wherein the gate has a second passage defined therein with an unrestricted flow profile, the second passage having a diameter substantially equal to a diameter of a flow passage defined through said housing.

4. The valve of claim 3, wherein the gate comprises a solid portion larger than a diameter of a flow passage defined through said housing.

5. The valve of claim 2, wherein the gate comprises a solid portion larger than a diameter of a flow passage defined through said housing.

6. The valve of claim 1, wherein the valve member comprises a ball.

7. The valve of claim 1, wherein the valve stem comprises a rising valve stem.

8. An apparatus, comprising:

a well tree having a production bore; and

a flow metering valve coupled to the well tree and communicating with the production bore, wherein the flow metering valve includes a valve member having a first passage defined therein with a metering flow profile and a second passage defined therein with an unrestricted flow profile, the second passage having a diameter substantially equal to a diameter of the production bore.

9. The apparatus of claim 8, wherein the valve member comprises a solid portion larger than a diameter of the production bore.

10. The apparatus of claim 8, wherein the valve member comprises a gate.

11. The apparatus of claim 1 or 8, wherein the metering profile comprises an unrestricted portion and a restricted portion, and the flow metering valve further defines a first pressure port communicating with the unrestricted portion and a second pressure port communicating with the restricted portion.

12. The apparatus of claim 11, wherein the second pressure port is defined in the valve member.

13. The apparatus of claim 11, wherein the first port is defined in a body of the flow metering valve.

14. The apparatus of claim 11, further comprising a differential pressure sensor coupled to the first and second ports.

15. The apparatus of claim 1 or 8, wherein the flow metering valve includes an unrestricted portion and the metering profile comprises a restricted portion, and the flow metering valve further comprises at least one sensor communicating with the unrestricted portion and with the restricted portion.

16. The apparatus of claim 15, further comprising a controller disposed outside a pressure boundary of the flow metering valve, wherein the at least one pressure sensor is disposed within the pressure boundary, and the controller is operable to communicate with the at least one pressure sensor through the pressure boundary without penetrating the pressure boundary.

17. The apparatus of claim 1 or 8, wherein the metering profile comprises a venturi profile.

18. The apparatus of claim 1 or 8, wherein the metering profile comprises a Dall tube profile.

19. The apparatus of claim 1 or 8, wherein the metering profile comprises an orifice plate.

AMENDED CLAIMS
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CLAIMS

WE CLAIM:

1. A valve, comprising:

a housing;

a stem supported by the housing;

a valve member coupled to the stem and having a first passage defined therein with a metering flow profile alignable with a flow passage defined through said housing.

2. The valve of claim 1, wherein the valve member comprises a gate.

3. The valve of claim 2, wherein the gate has a second passage defined therein with an unrestricted flow profile, the second passage having a diameter substantially equal to a diameter of a flow passage defined through said housing.

4. The valve of claim 3, wherein the gate comprises a solid portion larger than a diameter of said a flow passage defined through said housing.

5. The valve of claim 2, wherein the gate comprises a solid portion larger than a diameter of said a flow passage defined through said housing.

6. The valve of claim 1, wherein the valve member comprises a ball.

7. The valve of claim 1, wherein the valve stem comprises a rising valve stem.

8. An apparatus, comprising:

a well tree having a production bore; and

a flow metering valve coupled to the well tree and communicating with the production bore, wherein the flow metering valve includes a valve member having a first passage defined therein with a metering flow profile and a second passage defined therein with an unrestricted flow profile, the second passage having a diameter substantially equal to a diameter of the production bore, wherein said first and second

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passages are alignable with a flow passage defined through said flow metering valve.

9. The apparatus of claim 8, wherein the valve member comprises a solid portion larger than a diameter of the production bore.

10. The apparatus of claim 8, wherein the valve member comprises a gate.

11. The apparatus of claim 1 or 8, wherein the metering profile comprises an unrestricted portion and a restricted portion, and the flow metering valve further defines a first pressure port communicating with the unrestricted portion and a second pressure port communicating with the restricted portion.

12. The apparatus of claim 11, wherein the second pressure port is defined in the valve member.

13. The apparatus of claim 11, wherein the first port is defined in a body of the flow metering valve.

14. The apparatus of claim 11, further comprising a differential pressure sensor coupled to the first and second ports.

15. The apparatus of claim 1 or 8, wherein the flow metering valve includes an unrestricted portion and the metering profile comprises a restricted portion, and the flow metering valve further comprises at least one sensor communicating with the unrestricted portion and with the restricted portion.

16. The apparatus of claim 15, further comprising a controller disposed outside a pressure boundary of the flow metering valve, wherein the at least one pressure sensor is disposed within the pressure boundary, and the controller is operable to communicate with the at least one pressure sensor through the pressure boundary without penetrating the pressure boundary.

17. The apparatus of claim 1 or 8, wherein the metering profile comprises a venturi profile.

18. The apparatus of claim 1 or 8, wherein the metering profile comprises a Dall tube profile.

19. The apparatus of claim 1 or 8, wherein the metering profile comprises an orifice plate.

CLAIMS

WE CLAIM:

1. A gate valve, comprising:

a housing;

a stem supported by the housing;

a gate coupled to the stem and having a first passage defined in the gate with a metering flow profile and a second passage defined in the gate with an unrestricted flow profile, the second passage having a diameter substantially equal to a diameter of a flow passage defined through said housing, wherein the first and second passages are separate openings in the gate that are spaced-apart from one another along the gate and wherein the first and second passages are alignable with the flow passage defined through said housing.

2. The gate valve of claim 1, wherein the gate further comprises a solid portion larger than a diameter of said flow passage defined through said housing.

3. The gate valve of claim 1, wherein the valve stem comprises a rising valve stem.

4. An apparatus, comprising:

a well tree having a production bore; and

a flow metering valve coupled to the well tree and communicating with the production bore, wherein the flow metering valve includes a gate having a first passage defined therein with a metering flow profile and a second passage defined therein with an unrestricted flow profile, the second passage having a diameter substantially equal to a diameter of the production bore, wherein said first and second passages are separate openings in the gate that are spaced-apart from one another along the gate and wherein the first and second passages are alignable with a flow passage defined through said flow metering valve.

5. The apparatus of claim 4, wherein the gate further comprises a solid portion larger than a diameter of the production bore.

6. The apparatus of claim 1 or 4, wherein the metering flow profile comprises an unrestricted portion and a restricted portion, and the flow metering valve further defines a first pressure port communicating with the unrestricted portion and a second pressure port communicating with the restricted portion.

7. The apparatus of claim 6, wherein the second pressure port is defined in the gate.

8. The apparatus of claim 6, wherein the first port is defined in a body of the flow metering valve.

9. The apparatus of claim 6, further comprising a differential pressure sensor coupled to the first and second ports.

10. The apparatus of claim 1 or 4, wherein the metering flow profile includes an unrestricted portion and a restricted portion, and the flow metering valve further comprises at least one sensor communicating with the unrestricted portion and with the restricted portion.

11. The apparatus of claim 10, further comprising a controller disposed outside a pressure boundary of the flow metering valve, wherein the at least one pressure sensor is disposed within the pressure boundary, and the controller is operable to communicate with the at least one pressure sensor through the pressure boundary without penetrating the pressure boundary.

12. The apparatus of claim 1 or 4, wherein the metering flow profile comprises a venturi profile.

13. The apparatus of claim 1 or 4, wherein the metering flow profile comprises a Dall tube profile.

14. The apparatus of claim 1 or 4, wherein the metering flow profile comprises an orifice plate.

15. A ball valve, comprising:

a housing;

a stem supported by the housing;

a ball coupled to the stem and having a first passage defined in the ball with a metering flow profile wherein the ball is rotatable between a first open position where the first passage is alignable with a flow passage defined through said housing and a second closed position where the ball blocks the flow passage through the housing.

16. The ball valve of claim 15, wherein the ball is rotatable between the first open position and the second closed position by rotation of the stem.

17. The ball valve of claim 15, wherein the metering flow profile comprises a venturi profile.

18. The ball valve of claim 15, wherein the metering flow profile comprises a Dall tube profile.

19. The ball valve of claim 15, wherein the metering flow profile comprises an unrestricted portion and a restricted portion, and the ball valve further comprises a first pressure port communicating with the unrestricted portion and a second pressure port communicating with the restricted portion,

20. The ball valve of claim 15, wherein the second pressure port is defined in the ball.

21. The ball valve of claim 15, wherein the first port is defined in a body of the flow metering valve.

22. The ball valve of claim 15, further comprising a differential pressure sensor coupled to the first and second ports.

23. The ball valve of claim 15, wherein the metering flow profile includes an unrestricted portion and a restricted portion, and the ball valve further comprises at least one sensor communicating with the unrestricted portion and with the restricted portion.

24. The ball valve of claim 15, further comprising a controller disposed outside a pressure boundary of the ball valve, wherein the at least one pressure sensor is disposed within the pressure boundary, and the controller is operable to communicate with the at least one pressure sensor through the pressure boundary without penetrating the pressure boundary.

25. An apparatus, comprising:

a well tree having a production bore; and

a flow metering valve coupled to the well tree and communicating with the production bore, wherein the flow metering valve includes a housing, a stem, a ball coupled to the stem and a first passage defined in the ball with a metering flow profile wherein the ball is rotatable between a first open position where the first passage is alignable with a flow passage defined through said housing and a second closed position where the ball blocks the flow passage through the housing.

26. The apparatus of claim 25, wherein the metering flow profile comprises an unrestricted portion and a restricted portion, and the flow metering valve further defines a first pressure port communicating with the unrestricted portion and a second pressure port communicating with the restricted portion.

27. The apparatus of claim 26, wherein the second pressure port is defined in the ball.

28. The apparatus of claim 26, wherein the first port is defined in a body of the flow metering valve.

29. The apparatus of claim 26, further comprising a differential pressure sensor coupled to the first and second ports.

30. The apparatus of claim 25, wherein the metering flow profile includes an unrestricted portion and a restricted portion, and the flow metering valve further comprises at least one sensor communicating with the unrestricted portion and with the restricted portion.

31. The apparatus of claim 25, further comprising a controller disposed outside a pressure boundary of the flow metering valve, wherein the at least one pressure sensor is disposed within the pressure boundary, and the controller is operable to communicate with the at least one pressure sensor through the pressure boundary without penetrating the pressure boundary.

32. The apparatus of claim 25, wherein the metering flow profile comprises a venturi profile.

33. The apparatus of claim 25, wherein the metering flow profile comprises a Dall tube profile.