CLAIMS

What is claimed is.

1. A gate valve assembly comprising:

a body;

a passage through the body that is selectively coupled with a source of fracturing fluid used for fracturing a subterranean formation;

a gate slideable in the body, and having a bore that selectively registers with the passage;

an actuating stem coupled to an end of the gate and that projects into a channel in the body;

a backseat seal on an outer surface of the actuating stem that is in selective engagement with a profile in the channel;

a balancing stem coupled to an end of the gate distal from the actuating stem; and

a plenum enclosing an end of the balancing stem distal from the gate valve, so that when the plenum is pressurized, a force is applied to the end of the balancing stem distal from the gate valve to urge the backseat seal into sealing engagement with the profile in the channel.

2. The gate valve assembly of claim 1, further comprising a piston on the end of the balancing stem distal from the gate valve and having an outer periphery in sealing contact with an inner surface of the plenum.

3. The gate valve assembly of claim 1, wherein a pressure source is in pressure communication with the plenum.

4. The gate valve assembly of claim 1, wherein the backseat seal projects radially outward from an outer surface of the actuating stem and has a wedge shaped cross section.

5. The gate valve assembly of claim 4, wherein the profile has a shape that is complementary to the backseat seal and is defined where an inner diameter of the channel transitions radially inward.

6. The gate valve assembly of claim 1, further comprising an upper bonnet having a chamber in which the end of the actuating stem coupled to the gate is disposed, and a lower bonnet a chamber in which the end of the balancing stem coupled to the gate is disposed, wherein the chambers in the upper and lower bonnets are in pressure communication with the passage.

7. The gate valve assembly of claim 1, further comprising an axial actuator coupled to an end of the actuating stem distal from the gate for axially moving the stem.

8. A method of regulating flow to a wellhead assembly comprising:

a. providing a gate valve assembly having a body, a gate moveable in the body, an actuating stem coupled to an end of the gate, a backseat seal on the actuating stem, and a balancing stem coupled to an end of the gate distal from the actuating stem;

b. communicating fluid to the gate valve assembly so that pressure in the fluid is applied to ends of the actuating stem and balancing stem coupled to the gate and

generates substantially equal forces that are applied to the gate in opposite directions; and

c. applying a force to urge the balancing stem against the gate in a direction that displaces the actuating stem so that the backseat seal engages a profile in the body to form a seal around a portion of the actuating stem.

9. The method of claim 8, wherein the step of forcing the balancing stem comprises pressurizing an area around an end of the balancing stem distal from the gate.

10. The method of claim 9, wherein the area is pressurized by providing a plenum around the end of the balancing stem distal from the gate and flowing pressurized fluid to the plenum.

11. The method of claim 8, further comprising replacing packing in an annulus between the actuating stem and the body that is isolated from pressure of the fluid of step (b) by the backseat seal.

12. The method of claim 8, further comprising removing the force of step (c).

13. A wellhead assembly mounted over a wellbore comprising:

a production tree;

a valve block on the production tree in fluid communication with a source of fracturing fluid; and

a valve assembly on the valve block comprising:

a valve body having a passage in fluid communication with the fracturing fluid,

a gate in the body,

an actuating stem having a lower end that is mounted on an upper end of the gate and that is in pressure communication with the passage,

a backseat seal circumscribing a portion of the actuating stem,

a balancing stem having an upper end mounted on a lower end of the gate and that is in pressure communication with the passage, and

a means for selectively forcing the balancing stem upward and against the gate and to seat the backseat seal against a profile in the body to form a seal.

14. The wellhead assembly of claim 13, wherein the means for selectively forcing the balancing stem upward comprises a plenum mounted on a lower end of the valve body that is in communication with a source of pressurized fluid.

15. The wellhead assembly of claim 14, wherein the plenum has an inner diameter sized to be in selective sealing contact with an outer surface of the balancing stem.

16. The wellhead assembly of claim 14, further comprising a piston on a lower end of the balancing stem.

17. The wellhead assembly of claim 14, further comprising a hand wheel on the valve assembly for moving the gate.

CLAIMS:

1. A gate valve assembly comprising:

a body;

a passage through the body that is selectively coupled with a source of fracturing fluid used for fracturing a subterranean formation;

a gate slideable in the body, and having a bore that selectively registers with the passage;

an actuating stem coupled to an end of the gate and that projects into a channel in the body;

a backseat seal on an outer surface of the actuating stem that is in selective engagement with a profile in the channel;

a balancing stem coupled to an end of the gate distal from the actuating stem; and

a plenum enclosing an end of the balancing stem distal from the gate valve, so that when the plenum is pressurized, a force is applied to the end of the balancing stem distal from the gate valve to urge the backseat seal into sealing engagement with the profile in the channel.

2. The gate valve assembly of claim 1, further comprising a piston on the end of the balancing stem distal from the gate valve and having an outer periphery in sealing contact with an inner surface of the plenum.

3. The gate valve assembly of claim 1 or claim 2, wherein a pressure source is in pressure communication with the plenum.

4. The gate valve assembly of any preceding claim, wherein the backseat seal projects radially outward from an outer surface of the actuating stem and has a wedge shaped cross section.

5. The gate valve assembly of any preceding claim, wherein the profile has a shape that is complementary to the backseat seal and is defined where an inner diameter of the channel transitions radially inward.

6. The gate valve assembly of any preceding claim, further comprising an upper bonnet having a chamber in which the end of the actuating stem coupled to the gate is disposed, and a lower bonnet a chamber in which the end of the balancing stem coupled to the gate is disposed, wherein the chambers in the upper and lower bonnets are in pressure communication with the passage.

7. The gate valve assembly of any preceding claim, further comprising an axial actuator coupled to an end of the actuating stem distal from the gate for axially moving the stem.

8. A method of regulating flow to a wellhead assembly comprising:

a. providing a gate valve assembly having a body, a gate moveable in the body, an actuating stem coupled to an end of the gate, a backseat seal on the actuating stem, and a balancing stem coupled to an end of the gate distal from the actuating stem;

b. communicating fluid to the gate valve assembly so that pressure in the fluid is applied to ends of the actuating stem and balancing stem coupled to the gate and generates substantially equal forces that are applied to the gate in opposite directions; and

c. applying a force to urge the balancing stem against the gate in a direction that displaces the actuating stem so that the backseat seal engages a profile in the body to form a seal around a portion of the actuating stem.

9. The method of claim 8, wherein the step of forcing the balancing stem comprises pressurizing an area around an end of the balancing stem distal from the gate.

10. The method of claim 8 or claim 9, wherein the area is pressurized by providing a plenum around the end of the balancing stem distal from the gate and flowing pressurized fluid to the plenum.

11. The method of any of claims 8 to 10, further comprising replacing packing in an annulus between the actuating stem and the body that is isolated from pressure of the fluid of step (b) by the backseat seal.

12. The method of any of claims 8 to 11, further comprising removing the force of step (c).

13. A wellhead assembly mounted over a wellbore comprising:

a production trcc;

a valve block on the production tree in fluid communication with a source of fracturing fluid; and

a valve assembly on the valve block comprising:

a valve body having a passage in fluid communication with the fracturing fluid,

a gate in the body,

an actuating stem having a lower end that is mounted on an upper end of the gate and that is in pressure communication with the passage,

a backseat seal circumscribing a portion of the actuating stem,

a balancing stem having an upper end mounted on a lower end of the gate and that is in pressure communication with the passage, and

a means for selectively forcing the balancing stem upward and against the gate and to seat the backseat seal against a profile in the body to form a seal.

14. The wellhead assembly of claim 13, wherein the means for selectively forcing the balancing stem upward comprises a plenum mounted on a lower end of the valve body that is in communication with a source of pressurized fluid.

15. The wellhead assembly of claim 13 or claim 14, wherein the plenum has an inner diameter sized to be in selective sealing contact with an outer surface of the balancing stem.

16. The wellhead assembly of any of claims 13 to 15, further comprising a piston on a lower end of the balancing stem.

17. The wellhead assembly of any of claims 13 to 16, further comprising a hand wheel on the valve assembly for moving the gate.

18. A wellhead assembly mounted over a wellbore, the well head assembly comprising:

a production tree;

a valve block on the production tree in fluid communication with a source of fracturing fluid; and

a gate valve assembly according to any of claims 1 to 7 on the valve block.

19. A gate valve assembly substantially as hereinbefore described with reference to the accompanying drawings.

20. A method of regulating flow to a wellhead assembly substantially as hereinbefore described with reference to the accompanying drawings.

21. A wellhead assembly substantially as hereinbefore described with reference to the accompanying drawings.