WHAT IS CLAIMED IS:

1. A gate valve seat (27) for reception in a gate valve passage (15) counterbore comprising:

a tubular body (27) having a face for contact with a gate (17), and an outer end (38) for location in the counterbore;

an annular cylindrical surface defining a recess (37) extending inward from the outer end (38) of the tubular body (27);

a spring member (43) having a cylindrical portion (44) that fits on the cylindrical surface of the recess (37) and a leg (45) having a free end for abutting a shoulder (25) of the counterbore; and

a metal-to-metal seal (41) between the cylindrical portion (44) of the spring member (43) and the cylindrical surface of the recess (37).

2. The gate valve seat (27) of Claim 1, wherein the leg (45) has a frustoconical configuration.

3. The gate valve seat (27) of Claim 1, wherein the seal (41) is located in a recess (47) found in the spring member (43).

4. The gate valve seat (27) of Claim 1, wherein the recess (37) of the tubular body (27) has a shoulder (39) facing outward and the seal (41) is located at the shoulder (39).

5. The gate valve seat (27) of Claim 1, wherein the seal (41) is located in a recess (47) of the spring member (43) on an end of the spring member (43) opposite the leg (45).

6. The gate valve seat (27) of Claim 1, wherein the tubular body (27) is adapted to fit loosely in the counterbore for axial movement relative to an axis of the passage (15).

7. The gate valve seat (27) of Claim 1, wherein the recess (37) in the tubular body (27) is located on an exterior of the tubular body (27).

8. The gate valve seat (27) of Claim 7, wherein the leg (45) extends from the cylindrical portion (44) toward an axis of the tubular body (27).

9. The gate valve seat (27) of Claim 1, wherein the recess (37) on the tubular body (27) is located in an interior of the tubular body (27).

10. The gate valve seat (27) of Claim 9, wherein the leg (45) extends from the cylindrical portion (44) away from an axis of the tubular body (27).

11. The gate valve seat (27) of Claim 1, wherein the cylindrical portion (44) of the spring member (43) has an inner diameter initially smaller than the outer diameter of the annular cylindrical surface of the recess (37) of the tubular body (27) so that the spring member (43) fits on the tubular body (27) by an interference fit to apply a radial preload force against the metal-to-metal seal (41).

12. A gate valve (11) having a flow passage (15) intersected by a chamber (21) containing a gate (17) and a counterbore formed in the flow passage (15), the gate valve (11) comprising:

a tubular body (27) having a face for contact with a gate (17), and an outer end (38) for location in the counterbore;

an annular cylindrical surface defining a recess (37) extending inward from the outer end (38) of the tubular body (27);

a spring member (43) having a cylindrical portion (44) that fits on the cylindrical surface of the recess (37) and a frustoconical leg (45) having a free end for abutting a shoulder (25) of the counterbore; and

a metal-to-metal seal (41) between the cylindrical portion (44) of the spring member (43) and the cylindrical surface of the recess(37) ; and

wherein the tubular body (27) is adapted to fit loosely in the counterbore for axial movement relative to an axis of the passage (15).

13. The gate valve (11) of Claim 12, wherein the seal (41) is located in a recess (47) found in the spring member (43).

14. The gate valve (11) of Claim 12, wherein the recess (37) of the tubular body (27) has a shoulder (39) facing outward and the seal (41) is located at the shoulder (39).

15. The gate valve (11) of Claim 12, wherein the seal (41) is located in a recess (47) of the spring member (43) on an end of the spring member (43) opposite the leg (45).

16. The gate valve (11) of Claim 12, wherein:

the recess (37) in the tubular body (27) is located on an exterior of the tubular body (27); and

the leg (45) extends from the cylindrical portion (44) toward an axis of the tubular body (27).

17. The gate valve (11) of Claim 12, wherein:

the recess (37) on the tubular body (27) is located in an interior of the tubular body (27); and

the leg (45) extends from the cylindrical portion (44) away from an axis of the tubular body (27).

18. A method of sealing around a seat ring (27) of a gate valve (11), comprising:

(a) providing a tubular body (27) having a face for contact with a gate (17), an outer end (38) for location in a counterbore, and an annular cylindrical surface defining a recess (37) extending inward from the outer end (38);

(b) fitting a spring member (43) having a cylindrical portion (44) on the cylindrical surface of the recess (37) and abutting a frustoconical leg (45) having a free end against a shoulder (25) of the counterbore;

(c) creating a metal-to-metal seal (41) between the cylindrical portion (44) of the spring member (43) and the cylindrical surface of the recess (37); and

(d) adapting the tubular body (27) to fit loosely in the counterbore for axial movement relative to an axis of the passage (15).

19. The method of Claim 18, wherein step (b) comprises extending the leg (45) from the cylindrical portion (44) toward an axis of the tubular body (27) when the recess (37) in the tubular body (27) is located on an exterior of the tubular body (27).

20. The method of Claim 18, wherein step (b) comprises extending the leg (45) from the cylindrical portion (44) away from an axis of the tubular body (27) when the recess (37) in the tubular body (27) is located on an interior of the tubular body (27).

WHAT IS CLAIMED IS:

1. A gate valve seat circumscribing a passage formed through a gate valve body comprising:

a tubular body having a face for contact with a gate, and an outer end extending into a counterbore formed in the gate valve body;

an annular cylindrical surface defining a recess extending inward from the outer end of the tubular body;

a spring member having a cylindrical portion that fits on the cylindrical surface of the recess and a leg having a free end for abutting a shoulder of the counterbore; and

a metal-to-metal seal between the cylindrical portion of the spring member and the cylindrical surface of the recess; and

wherein the seal is located in a recess found in the spring member.

2. The gate valve seat of claim 1, wherein the leg has a frustoconical configuration.

3. The gate valve seat of claim 1, wherein the recess of the tubular body has a shoulder facing outward and the seal is located at the shoulder.

4. The gate valve seat of claim 1, wherein the seal is located in a recess of the spring member on an end of the spring member opposite the leg.

5. The gate valve seat of claim 1, wherein the tubular body is adapted to fit loosely in the counterbore for axial movement relative to an axis of the passage.

6. The gate valve seat of claim 1, wherein the recess in the tubular body is located on an exterior of the tubular body.

7. The gate valve seat of claim 6, wherein the leg extends from the cylindrical portion toward an axis of the tubular body.

8. The gate valve seat of claim 1, wherein the recess on the tubular body is located in an interior of the tubular body.

9. The gate valve seat of claim 8, wherein the leg extends from the cylindrical portion away from an axis of the tubular body.

10. The gate valve seat of claim 1, wherein the cylindrical portion of the spring member has an inner diameter initially smaller than the outer diameter of the annular cylindrical surface of the recess of the tubular body so that the spring member fits on the tubular body by an interference fit to apply a radial preload force against the metal-to-metal seal.

11. A gate valve comprising:

a body having a chamber;

a passage intersecting the body and the chamber;

a gate moveable in the chamber and having a bore in the gate that is selectively registerable with the passage;

annular counterbores circumscribing the passage in a portion of the body adjacent the chamber, and that each have a curved sidewall that depends axially from a planar face;

annular seat seals generally coaxial with the passage and each having an inner end in contact with the gate, and an outer end inserted within a one of the counterbores;

annular recesses on outer ends of the seat seals;

spring members, each having an annular base portion set into a one of the recesses and generally coaxial with the passage, and an annular leg portion with an outer diameter coupled to an axial end of the base portion and an inner diameter in sealing contact with a one of the planar faces; and

metal-to-metal seals located in grooves found in each of the spring members.

12. The gate valve of claim 11, wherein the grooves each have a shoulder facing outward and the seal is located at the shoulder.

13. The gate valve of claim 1, wherein the grooves are located on ends of the base portions opposite the legs.

14. The gate valve of claim 11, wherein:

the recesses are located on exteriors of the seat seals; and

the legs extend toward an axis of the seat seals.

15. The gate valve of claim 11, wherein:

the recesses are located in interiors of the seat seals; and

the legs extend from the base portions away from an axis of the seat seals.

16. A method of sealing in a gate valve having a body, chamber in the body, a passage intersecting the body and the chamber, and a gate moveable within the chamber having a bore that selectively registers with the passage, the method comprising:

providing an annular seat ring having an inner end with a face for contact with the gate, an outer end for location in a counterbore in the body that circumscribes the passage and is adjacent the chamber, and an annular recess formed on a surface of the seat ring extending axially from the outer end;

providing a spring member having an annular base portion that is generally coaxial with the passage, and an annular leg portion having an outer diameter that depends from a lateral edge of the base portion, an inner diameter set radially inward from the base portion, and having a frustoconical cross section;

fitting the spring member on the seat ring so that the base portion is set in the annular recess and inner diameter of the leg portion is axially set back from the outer end of the seat ring in a direction away from the inner end of the seat ring;

inserting the seat ring into the chamber so that the outer end of the seat ring projects into the counterbore, and so that the leg portion is in sealing contact with a planar surface in the counterbore; and

sealing between the base portion and the seat ring with a hollow metal o-ring.

17. The method of claim 16, wherein the recess formed on one of an outer surface of the seat ring, or an inner surface of the seat ring.