What is claimed is:

1. A downhole circulating valve comprising:

a generally tubular outer housing having an axially extending internal passageway including an internal seat and at least one generally radially extending opening formed through the housing intersecting the internal seat; and

a valve element rotatably disposed within the internal passageway, the valve element having an axially extending internal bore and a head portion disposed at least partially within the internal seat, the head portion including at least one generally radially extending seal element, the valve element having a first position relative to the housing wherein the at least one seal element is not aligned with the at least one opening allowing fluid communication between the at least one opening and the internal passageway and a second position relative to the housing wherein the at least one seal element is aligned with the at least one opening and wherein the at least one seal element forms a metal-to-metal seal with the internal seat preventing fluid communication between the at least one opening and the internal passageway.

2. The downhole circulating valve as recited in claim 1 wherein the internal seat further comprises a spherical segment having a first radius.

3. The downhole circulating valve as recited in claim 2 wherein the at least one generally radially extending opening extends generally in the direction of the first radius.

4. The downhole circulating valve as recited in claim 2 wherein an outer surface of the head portion further comprises a spherical segment having a second radius.

5. The downhole circulating valve as recited in claim 4 wherein the head portion further comprises at least one generally radially extending port that is circumferentially offset from the at least one seal element, wherein, in the first position, the at least one generally radially extending port is in fluid communication with the at least one opening and wherein the at least one generally radially extending port extends generally in the direction of the second radius.

6. The downhole circulating valve as recited in claim 4 wherein the at least one generally radially extending seal element extends generally in the direction of the second radius.

7. The downhole circulating valve as recited in claim 4 wherein the first radius and the second radius are sized to enable spherical mating of the at least one seal element and the internal seat.

8. The downhole circulating valve as recited in claim 1 wherein the at least one seal element further comprises a seal ring having a circular cross section.

9. The downhole circulating valve as recited in claim 1 wherein the at least one seal element further comprises a pair of concentric seal rings each having a circular cross section.

10. The downhole circulating valve as recited in claim 1 wherein the head portion translates toward the internal seat when the valve element is operated from the first position to the second position to form the metal-to-metal seal.

11. The downhole circulating valve as recited in claim 1 wherein the housing further includes a plurality of circumferentially distributed generally radially extending openings formed through the housing intersecting the internal seat, wherein the head portion further includes a plurality of circumferentially distributed generally radially extending ports and a plurality of circumferentially distributed generally radially extending seal elements that are circumferentially offset from the ports and wherein, in the first position, the ports are in fluid communication with the openings and, in the second position, each of the seal elements is aligned with one of the openings and forms a metal-to-metal seal with the internal seat preventing fluid communication between the openings and the internal passageway.

12. A downhole circulating valve comprising:

a generally tubular outer housing having an axially extending internal passageway including a spherical segment internal seat having a first radius and at least one generally radially extending opening formed through the housing intersecting the internal seat; and

a valve element rotatably disposed within the internal passageway, the valve element having an axially extending internal bore and a head portion having an outer surface including a spherical segment with a second radius, the head portion translatable relative to and disposed at least partially within the internal seat, the head portion including at least one generally radially extending port and at least one generally radially extending seal element that is circumferentially offset from the port, the valve element having a first position relative to the housing wherein the port is in fluid communication with the opening and a second position relative to the housing wherein the seal element is aligned with the opening and wherein the seal element forms a metal-to-metal seal with the internal seat,

wherein, the first radius and the second radius are sized to enable spherical mating of the at least one generally radially extending seal element and the internal seat; and

wherein, the head portion translates toward the internal seat when the valve element is operated from the first position to the second position.

13. The downhole circulating valve as recited in claim 12 wherein the at least one generally radially extending seal element further comprises at least one seal ring having a circular cross section.

14. The downhole circulating valve as recited in claim 12 wherein the housing further includes a plurality of circumferentially distributed generally radially extending openings formed through the housing intersecting the internal seat, wherein the head portion further includes a plurality of circumferentially distributed generally radially extending ports and a plurality of circumferentially distributed generally radially extending seal elements that are circumferentially offset from the ports and wherein, in the first position, the ports are in fluid communication with the openings and, in the second position, each of the seal elements is aligned with one of the openings and forms a metal-to-metal seal with the internal seat.

15. A downhole circulating system comprising:

a downhole power unit having an engagement assembly and a rotatable shaft; and

a circulating valve including:

a generally tubular outer housing having an axially extending internal passageway including a profile, an internal seat and at least one generally radially extending opening formed through the housing intersecting the internal seat; and

a valve element rotatably disposed within the internal passageway, the valve element having an axially extending internal bore with a profile and a head portion disposed at least partially within the internal seat, the head portion including at least one generally radially extending seal element;

wherein, a first portion of the engagement assembly is operably associated with the profile of the housing and a second portion of the engagement assembly is operably associated with the profile of the valve element such that when the downhole power unit is activated and the rotatable shaft is rotated, the valve element is rotatable between a first position relative to the housing wherein the at least one seal element is not aligned with the at least one opening allowing fluid communication between the at least one opening and the internal passageway and a second position relative to the housing wherein the at least one seal element is aligned with the at least one opening and wherein the at least one seal element forms a metal-to-metal seal with the internal seat preventing fluid communication between the at least one opening and the internal passageway.

16. The downhole circulating system as recited in claim 15 wherein the downhole power unit further comprises an electric motor operably associated with the rotatable shaft to impart motion thereto.

17. The downhole circulating system as recited in claim 15 wherein the internal seat further comprises a spherical segment having a first radius and wherein the at least one generally radially extending opening extends generally in the direction of the first radius.

18. The downhole circulating system as recited in claim 17 wherein at least a section of an outer surface of the head portion further comprises a spherical segment having a second radius and wherein the at least one generally radially extending seal element extends generally in the direction of the second radius.

19. The downhole circulating system as recited in claim 18 wherein the first radius and the second radius are sized to enable spherical mating of the at least one generally radially extending seal element and the internal seat when the valve element is rotated from the first position to the second position and the head portion is translated toward the internal seat.

20. The downhole circulating system as recited in claim 15 wherein the housing further includes a plurality of circumferentially distributed generally radially extending openings formed through the housing intersecting the internal seat, wherein the head portion further includes a plurality of circumferentially distributed generally radially extending seal elements and wherein, in the first position, the seal elements are not aligned with the openings and, in the second position, each of the seal elements is aligned with one of the openings and forms a metal-to-metal seal with the internal seat.

21. A method for operating a downhole circulating valve comprising:

providing a circulating valve having a generally tubular outer housing having an axially extending internal passageway including an internal seat and at least one generally radially extending opening formed through the housing intersecting the internal seat and a valve element rotatably disposed within the internal passageway, the valve element having an axially extending internal bore and a head portion disposed at least partially within the internal seat, the head portion including at least one seal element;

running the circulating valve into a wellbore on a tubular string;

running a rotating tool into the tubular string and engaging the circulating valve; and

activating the rotating tool to rotate the valve element between a first position relative to the housing wherein the at least one seal element is not aligned with the at least one opening and a second position relative to the housing wherein the at least one seal element is aligned with the at least one opening and wherein the at least one seal element forms a metal-to-metal seal with the internal seat.

22. The method as recited in claim 21 wherein running the rotating tool into the tubular string and engaging the circulating valve further comprises running a downhole power unit having a rotatable shaft into the tubular string and engaging a profile of the housing and a profile of the valve element with the downhole power unit.

23. The method as recited in claim 22 wherein activating the rotating tool to rotate the valve element further comprises activating an electric motor of the downhole power unit to impart rotary motion to the rotatable shaft.

24. The method as recited in claim 21 wherein forming the metal-to-metal seal between the seal element and the internal seat further comprises spherical mating the seal element and the internal seat by translating the head portion toward the internal seat.

25. The method as recited in claim 21 wherein forming the metal-to-metal seal between the seal element and the internal seat further comprises creating a metal-to-metal seal between at least one generally radially extending seal ring of the seal element and the internal seat.

What is claimed is:

1. A downhole circulating valve comprising:

a generally tubular outer housing having an axially extending internal passageway including an internal seat and at least one generally radially extending opening formed through the housing intersecting the internal seat; and

a valve element rotatably disposed within the internal passageway, the valve element having an axially extending internal bore and a head portion disposed at least partially within the internal seat, the head portion including at least one generally radially extending seal element, the valve element having a first position relative to the housing wherein the at least one seal element is not aligned with the at least one opening allowing fluid communication between the at least one opening and the internal passageway and a second position relative to the housing wherein the at least one seal element is aligned with the at least one opening and wherein the at least one seal element forms a metal-to-metal seal with the internal seat preventing fluid communication between the at least one opening and the internal passageway,

wherein the head portion translates toward the internal seat when the valve element is operated from the first position to the second position to form the metal-to-metal seal.

2. The downhole circulating valve as recited in claim 1 wherein the internal seat further comprises a spherical segment having a first radius.

3. The downhole circulating valve as recited in claim 2 wherein the at least one generally radially extending opening extends generally in the direction of the first radius.

4. The downhole circulating valve as recited in claim 2 wherein an outer surface of the head portion further comprises a spherical segment having a second radius.

5. The downhole circulating valve as recited in claim 4 wherein the head portion further comprises at least one generally radially extending port that is circumferentially offset from the at least one seal element, wherein, in the first position, the at least one generally radially extending port is in fluid communication with the at least one opening and wherein the at least one generally radially extending port extends generally in the direction of the second radius.

6. The downhole circulating valve as recited in claim 4 wherein the at least one generally radially extending seal element extends generally in the direction of the second radius.

7. The downhole circulating valve as recited in claim 4 wherein the first radius and the second radius are sized to enable spherical mating of the at least one seal element and the internal seat.

8. The downhole circulating valve as recited in claim 1 wherein the at least one seal element further comprises a seal ring having a circular cross section.

9. The downhole circulating valve as recited in claim 1 wherein the at least one seal element further comprises a pair of concentric seal rings each having a circular cross section.

10. The downhole circulating valve as recited in claim 1 wherein the housing further includes a plurality of circumferentially distributed generally radially extending openings formed through the housing intersecting the internal seat, wherein the head portion further includes a plurality of circumferentially distributed generally radially extending ports and a plurality of circumferentially distributed generally radially extending seal elements that are circumferentially offset from the ports and wherein, in the first position, the ports are in fluid communication with the openings and, in the second position, each of the seal elements is aligned with one of the openings and forms a metal-to-metal seal with the internal seat preventing fluid communication between the openings and the internal passageway.

11. A downhole circulating valve comprising:

a generally tubular outer housing having an axially extending internal passageway including a spherical segment internal seat having a first radius and at least one generally radially extending opening formed through the housing intersecting the internal seat; and

a valve element rotatably disposed within the internal passageway, the valve element having an axially extending internal bore and a head portion having an outer surface including a spherical segment with a second radius, the head portion translatable relative to and disposed at least partially within the internal seat, the head portion including at least one generally radially extending port and at least one generally radially extending seal element that is circumferentially offset from the port, the valve element having a first position relative to the housing wherein the port is in fluid communication with the opening and a second position relative to the housing wherein the seal element is aligned with the opening and wherein the seal element forms a metal-to-metal seal with the internal seat,

wherein, the first radius and the second radius are sized to enable spherical mating of the at least one generally radially extending seal element and the internal seat; and

wherein, the head portion translates toward the internal seat when the valve element is operated from the first position to the second position.

12. The downhole circulating valve as recited in claim 11 wherein the at least one generally radially extending seal element further comprises at least one seal ring having a circular cross section.

13. The downhole circulating valve as recited in claim 11 wherein the housing further includes a plurality of circumferentially distributed generally radially extending openings formed through the housing intersecting the internal seat, wherein the head portion further includes a plurality of circumferentially distributed generally radially extending ports and a plurality of circumferentially distributed generally radially extending seal elements that are circumferentially offset from the ports and wherein, in the first position, the ports are in fluid communication with the openings and, in the second position, each of the seal elements is aligned with one of the openings and forms a metal-to-metal seal with the internal seat.

14. A downhole circulating system comprising:

a downhole power unit having an engagement assembly and a rotatable shaft; and a circulating valve including:

a generally tubular outer housing having an axially extending internal passageway including a profile, an internal seat and at least one generally radially extending opening formed through the housing intersecting the internal seat; and

a valve element rotatably disposed within the internal passageway, the valve element having an axially extending internal bore with a profile and a head portion disposed at least partially within the internal seat, the head portion including at least one generally radially extending seal element;

wherein, a first portion of the engagement assembly is operably associated with the profile of the housing and a second portion of the engagement assembly is operably associated with the profile of the valve element such that when the downhole power unit is activated and the rotatable shaft is rotated, the valve element is rotatable between a first position relative to the housing wherein the at least one seal element is not aligned with the at least one opening allowing fluid communication between the at least one opening and the internal passageway and a second position relative to the housing wherein the at least one seal element is aligned with the at least one opening and wherein the at least one seal element forms a metal-to-metal seal with the internal seat preventing fluid communication between the at least one opening and the internal passageway,

wherein the head portion translates toward the internal seat when the valve element is operated from the first position to the second position to form the metal-to-metal seal.

15. The downhole circulating system as recited in claim 14 wherein the downhole power unit further comprises an electric motor operably associated with the rotatable shaft to impart motion thereto.

16. The downhole circulating system as recited in claim 14 wherein the internal seat further comprises a spherical segment having a first radius and wherein the at least one generally radially extending opening extends generally in the direction of the first radius.

17. The downhole circulating system as recited in claim 16 wherein at least a section of an outer surface of the head portion further comprises a spherical segment having a second radius and wherein the at least one generally radially extending seal element extends generally in the direction of the second radius.

18. The downhole circulating system as recited in claim 17 wherein the first radius and the second radius are sized to enable spherical mating of the at least one generally radially extending seal element and the internal seat when the valve element is rotated from the first position to the second position and the head portion is translated toward the internal seat.

19. The downhole circulating system as recited in claim 14 wherein the housing further includes a plurality of circumferentially distributed generally radially extending openings formed through the housing intersecting the internal seat, wherein the head portion further includes a plurality of circumferentially distributed generally radially extending seal elements and wherein, in the first position, the seal elements are not aligned with the openings and, in the second position, each of the seal elements is aligned with one of the openings and forms a metal-to-metal seal with the internal seat.

20. A method for operating a downhole circulating valve comprising: providing a circulating valve having a generally tubular outer housing having an axially extending internal passageway including an internal seat and at least one generally radially extending opening formed through the housing intersecting the internal seat and a valve element rotatably disposed within the internal passageway, the valve element having an axially extending internal bore and a head portion disposed at least partially within the internal seat, the head portion including at least one seal element;

running the circulating valve into a wellbore on a tubular string;

running a rotating tool into the tubular string and engaging the circulating valve; and

activating the rotating tool to rotate the valve element between a first position relative to the housing wherein the at least one seal element is not aligned with the at least one opening and a second position relative to the housing wherein the at least one seal element is aligned with the at least one

opening and wherein the at least one seal element forms a metal-to-metal seal with the internal seat, wherein the head portion translates toward the internal seat when the valve element is operated from the first position to the second position to form the metal-to-metal seal.

21. The method as recited in claim 20 wherein running the rotating tool into the tubular string and engaging the circulating valve further comprises running a downhole power unit having a rotatable shaft into the tubular string and engaging a profile of the housing and a profile of the valve element with the downhole power unit.

22. The method as recited in claim 21 wherein activating the rotating tool to rotate the valve element further comprises activating an electric motor of the downhole power unit to impart rotary motion to the rotatable shaft.

23. The method as recited in claim 20 wherein forming the metal-to-metal seal between the seal element and the internal seat further comprises spherical mating the seal element and the internal seat by translating the head portion toward the internal seat.

24. The method as recited in claim 20 wherein forming the metal-to-metal seal between the seal element and the internal seat further comprises creating a metal-to-metal seal between at least one generally radially extending seal ring of the seal element and the internal seat.