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[72] Inventors **Hugh B. Carr**
McMurray;
Norman F. Bradel, Scott Township,
Allegheny County, Pa.

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[73] Assignee **S. P. Kinney Engineers, Inc.**
Carnegie, Pa.
a corporation of Pennsylvania

[54] **WATER COOLED VALVE DISK FOR GATE VALVES**
9 Claims, 1 Drawing Fig.

[52] **U.S. Cl.** **137/340**
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[50] **Field of Search** 137/340

[56] **References Cited**

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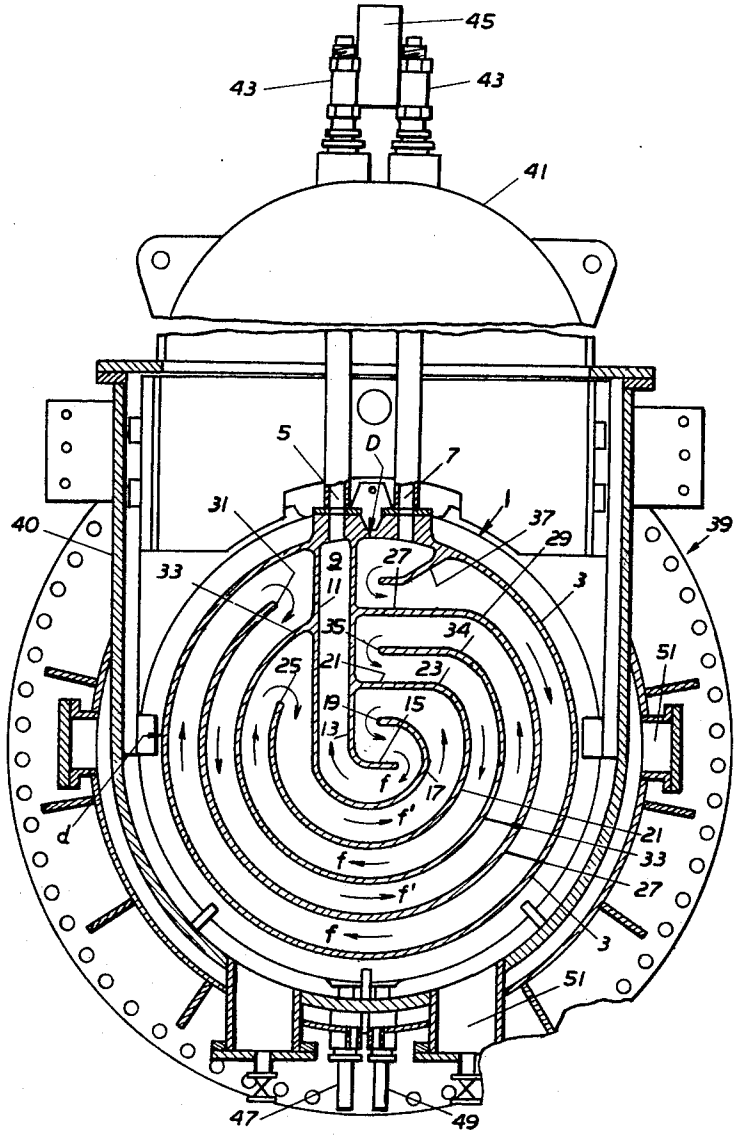
Primary Examiner—Samuel Scott
Attorney—Parmelee, Utzler & Welsh

ABSTRACT: A water-cooled valve disk is provided in the usual form of a circular hollow body with a peripheral wall in which two transversely extending flow-confining walls form a channel and extend from the peripheral wall to the central area of the disk with a port in the periphery opening into said channel and there are a plurality of concentric flow-confining walls, the outermost one of which is spaced from the peripheral wall and the innermost one of which surrounds and provides a passage into the central area, alternate concentric walls beginning with the outer one being joined at one end to one of said transversely extending walls and terminating in spaced relation to the other of said transverse walls, an intervening concentric wall extending from the other of said transverse walls toward but terminating in spaced relation to the first of said transverse walls, and a second port opening through the periphery of the disk adjacent the first port into the channel between the peripheral wall and the outermost concentric wall.



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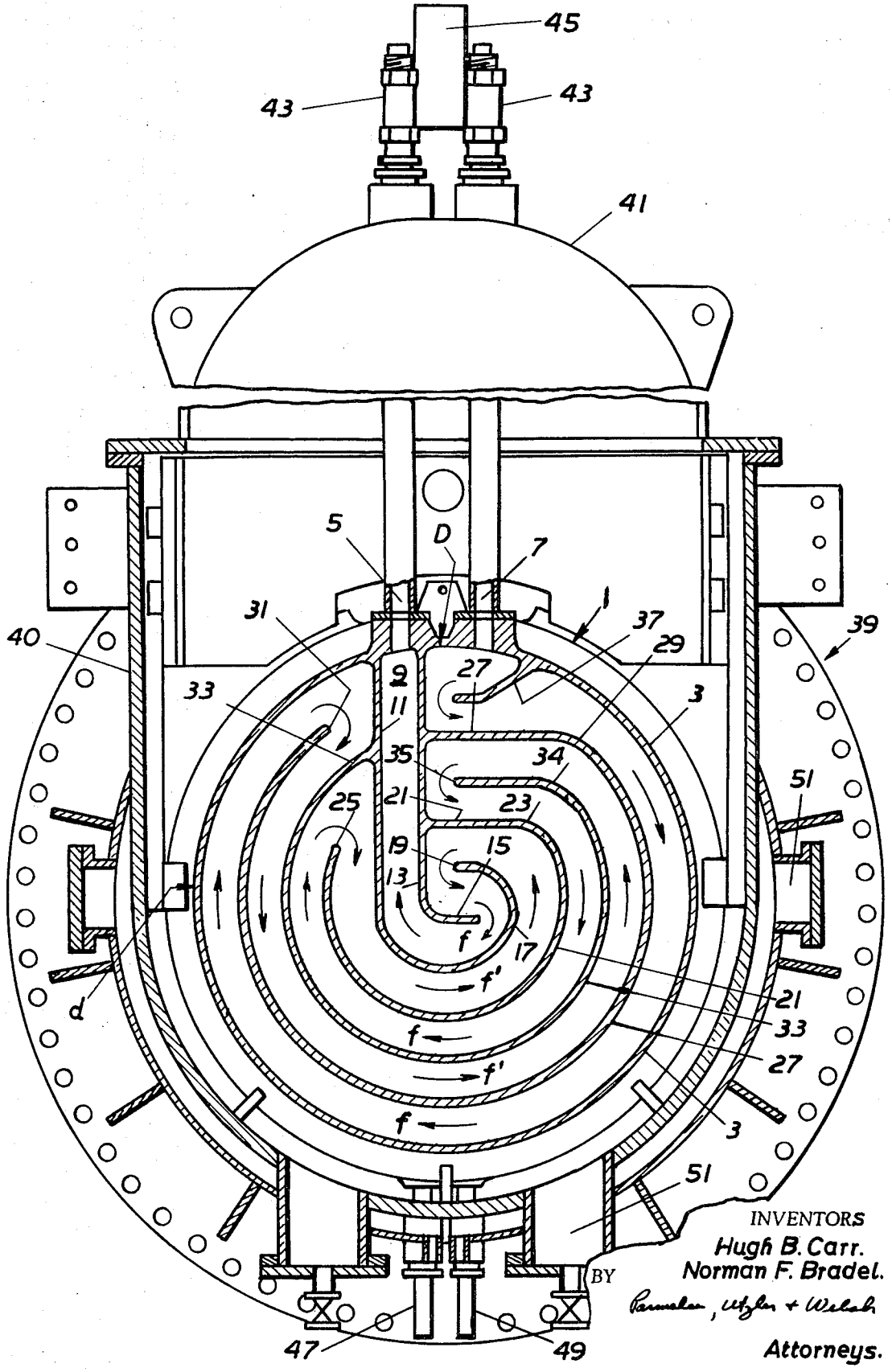

INVENTORS
Hugh B. Carr.
Norman F. Bradel.
BY
Parmelee, Utley & Welsh
Attorneys.

WATER COOLED VALVE DISK FOR GATE VALVES

BACKGROUND

Gate valves of the type used for example in controlling the flow of highly heated air in blast furnace installations, and elsewhere, are commonly provided with a water-cooled valve gate in the form of a hollow disc with internal walls forming more or less concentric channels. Water supply and exhaust lines are connected to adjacent locations on the peripheral wall of the valve disc. The concentric passages are so arranged that water may flow from the periphery to the center in concentric communicating passages and then out from the center to the outlet pipe, or in the reverse direction. A typical valve gate of this type is disclosed in U.S. Pat. No. 3,266,517 to Hugh B. Carr.

It is known that the efficiency of water cooling depends largely on the velocity of the water, the faster the flow the more efficient the cooling. The construction shown in said Carr patent provides the maximum number of convolute passages that can be provided without any dead end pockets and these passages are formed by two generally concentric walls, the inner ends of which terminate in the central area and each has a portion that is jointed to the peripheral wall of the disc.

For smaller size valves this is quite satisfactory but with larger valve discs the water channels or passages become wider. The amount of water that can be circulated is restricted by the necessarily small diameter of the supply and outflow pipes, so that as the passages become wider, the more sluggish is the flow through the cooling passages and the longer is its retention time inside the valve disc. While this may be partially offset by increasing the water pressure, there are practical limitations to such pressure increases.

SUMMARY OF THE INVENTION

The present invention provides a valve disc of construction wherein the number of concentric passages may be increased and which is not limited to two concentric partition walls, but three or more such walls may be provided whereby the water channels may be smaller in section and thereby secure a greater flow velocity of the cooling water. This enables less water to be used in smaller sizes of valves and enables large valve discs, such as those eight feet or more in diameter, to have a greater number of smaller passages than have heretofore been possible.

This is accomplished by providing a channel or duct between the two transverse walls extending from the periphery to the center area of the valve disc with a port in the periphery of the disc opening into this duct for the outflow of water from the central area, or the inflow of water to said area, as may be desired. There are at least three spaced concentric passage-forming walls, every other one of which is joined to one of these transverse walls and they terminate in spaced relation to the other, while the alternate one or ones are joined to the other of said transverse walls and terminate in spaced relation to the first transverse wall. The other of the two ports for the inlet or outlet of water opens into the concentric passage between the peripheral wall of the valve disc and the outermost of the concentric walls. Thus, more concentric passages are provided than are possible with previous constructions. At the same time the casting or assembly of the structure introduces no manufacturing complication and little additional weight is introduced into the gate.

BRIEF DESCRIPTION OF THE DRAWING

The attached drawing illustrates a cross-sectional view of the novel valve disc of the present invention is association with a gate valve.

DETAILED DESCRIPTION

Referring to the drawing, a hollow valve disc **1** is shown positioned in a gate valve **39**. The gate valve is of conventional structure and has a gate valve body **40**, a removable bonnet **41**, with stuffing boxes **43** thereon, yoke **45**, cleaning traps **51** and lines **47** and **49** for cooling. The gate valve construction is conventional and particularly described in U.S. Pat. No. 3,266,517 and, while forming no part of the present invention, illustrates an environment and utility of the valve disc herein claimed.

The valve disc **1** has a closed peripheral wall **3** with outlet port **5** and inlet port **7** thereon. Although it is possible to reverse the flow of water or other coolant through the valve disc **1**, for the purpose of clarity and brevity, the disc will be described as illustrated in its preferred embodiment shown in the drawing with the outlet port having a channel **9** extending inwardly therefrom transverse the disc and inlet means **7** adjacent thereto.

The outlet port **5** and inlet port **7** are positioned on opposed sides of a diameter D of the valve disc with a first and second flow channel forming walls **13** and **11** extending from port **5** into the central area of the disc and terminating in the central area, forming a channel **9**. The channel **9** extends a short distance beyond a second diameter *d* of the disc that is generally normal to the diameter D. The first wall **13** of the chamber **9** preferably terminates as an inwardly extending leg **15** generally parallel to the diameter *d* while the second wall **11** of channel **9** is spaced from and extends around the leg **15** and terminates at **19**, generally parallel to diameter D, a distance from the first wall **13**. A pair of spaced concentric walls **21** and **27** extend from the first wall **13**. Concentric wall **21** extends from first wall **13** towards the peripheral wall **3** of the disc to a point **23**, spaced from the first wall **13** and peripheral wall **3**, and continues in a circular path, a spaced distance from the peripheral wall **3** terminating at **25**, in spaced relation to the second wall **11**. The spaced concentric wall **27** also extends from first wall **13** toward the peripheral wall **3** to a point **29** where it then continues circularly, spaced from peripheral wall **3** and concentric wall **21**, until it terminates at **31**, in spaced relation to second wall **11**. An opposed second concentric spaced wall **33**, intermediate concentric walls **21** and **27** extends from second wall **11** and in a spaced circular path to a point **34** where it assumes a generally spaced position between concentric walls **21** and **27** and terminates at **35** in spaced relation to first wall **13**. Preferably, all concentric walls are spaced so that the distance between adjacent such walls corresponds to the width of channel **9**. Also, the second wall **11** of the channel **9** extends around the leg **15** with a spacing so that the spacing between leg **15** and second wall **11**, and terminal **19** are substantially the same. A baffle **37** is positioned on the peripheral wall **3** and extends inwardly so as to direct a stream from inlet port **7** towards the first wall **13** of channel **9**.

When the cooling valve disc is in operation, water or other coolant is forced through inlet port **7**, being directed towards the first wall **13** of channel **9** where the flow of water reverses itself and enters the region between the peripheral wall **3** and concentric wall **27**. Following circular flow *f* around the periphery, the flow of water, on contacting second wall **11** of channel **9**, will reverse flow around terminate point **31** of concentric wall **27** and proceed countercurrent to its initial flow. An adjacent countercurrent flow *f'* will be provided between concentric wall **27** and opposed second concentric wall **33** until striking first wall **13** of channel **9**, around terminal point **35** of second concentric wall **33** where reverse flow again occurs to give a flow *f* between second concentric wall **33** and concentric wall **21** in countercurrent flow to adjacent flow *f'* but in the same direction as flow *f* between peripheral wall **3** and concentric wall **27**. After flowing between concentric wall **21** and second concentric wall **33**, the stream contacts second wall **11** of channel **9**, flows around terminal **25** and in reverse flow *f'* through the space between second wall **11** including extension **17**, and concentric wall **21**, around terminal point **19** and by reverse flow is fed into channel **9** and directed out of outlet port **5** and discharged from the valve disc. This stream is thus fed to the disc through inlet port **7**, passed through the disc in a series of concentric, countercurrent flow

paths towards the center of the disc and then directed through exhaust channel 9 out of outlet port 5.

For purposes of flushing the disc or for optional use, the outlet port 5 and inlet port 7 can be reversed so that the initial flow of coolant will be fed through port 5 to the center of the valve and as eccentric countercurrent streams to the periphery of the disc and then out of the other port 7 for discharge from the disc, although the construction illustrated in the drawing is preferred.

The novel construction of the valve disc of the present invention permits increased velocity of the coolant through the disc and therefore provides better cooling of the disc. The disc is formed generally of metallic material and preferably of copper so as to provide a resistance to water when water is used as coolant. A particularly useful valve disc has been produced having a diameter of about 36 inches, with walls therein of one-half inch thickness and spacing for coolant flow of about 3 inch width. The present invention can of course be used for any size valve disc with the dimensions determined by the size of the gate valve opening for the disc and other considerations.

There has been described a novel valve disc for used in hot blast line gate valves that provides concentric countercurrent flow of coolant through the disc and exceptional velocity of the coolant therethrough with resultant cooling efficiency.

We claim:

1. A water cooled valve disc comprising a circular hollow body with a peripheral wall and having adjacent inlet and outlet ports on the peripheral wall, said body having first and second spaced flow channel forming walls extending from one port into the central area of the disc and terminating in said central area,

at least two concentric walls extending from said first wall toward said second wall and terminating in spaced relation to said second wall, said concentric walls being spaced from each other and from the peripheral wall and outwardly from the central area,

at least one second concentric wall extending from said second wall and terminating in spaced relation to said first wall, said second concentric wall being spaced midway between adjacent first two concentric walls,

the other of said ports opening into the space between the peripheral wall of the disc and one of said concentric walls.

2. A water-cooled valve disc as defined in claim 1 in which there is a baffle attached to the peripheral wall and arranged to direct the flow of water between said other port and the space between the peripheral wall and the outermost of said concentric walls against the closest of said flow channel forming walls.

3. The water-cooled valve disc as defined in claim 2 wherein there is a pair of said concentric walls and a single said second concentric wall intermediate said pair.

4. A water-cooled valve disc comprising a circular hollow body having a peripheral wall, wherein the interior of the body has flow directing walls arranged to provide a plurality of concentric flow passages in which the direction of flow is alternately reversed in each concentric passage characterized by:

a. first and second spaced flow directing walls extending in a direction transverse the valve body from the peripheral wall into the central area where said first and second walls terminate and forming between them a flow passage;

b. a port in the peripheral wall of the disc opening into said passage defined between said first and second walls;

c. at least two concentric walls extending circularly from said first wall towards but terminating in spaced relation to said second wall, said concentric walls being spaced from each other with the outermost being spaced from the peripheral wall and the innermost being spaced outwardly from the terminals of said first and second walls;

d. at least one further concentric wall extending circularly from said second wall toward but terminating in spaced relation to said first wall dividing the space between said concentric walls into separate channels;

e. and, a second port adjacent the first port opening into the space between the peripheral wall and the outermost concentric wall.

5. A hollow valve disc having a closed circular interior, inlet and outlet ports at the disc periphery on opposed sides of a diameter of the disc, an exhaust channel, formed by first and second walls extending inwardly from the outlet port a short distance beyond a second diameter of said disc normal to said diameter, and a plurality of concentric spaced walls, spaced from said periphery and from each other, positioned so as to direct a fluid stream from said inlet port in adjacent countercurrent concentric flow towards the center of the disc and out of said disc through the exhaust channel.

6. The hollow valve disc as described in claim 5 wherein said second wall is of greater length than said first wall with said first wall terminating as an inwardly extending leg generally parallel to said second diameter while said second wall extends around and is spaced from said leg and terminates in spaced relation to said first wall.

7. The hollow valve disc as described in claim 6 wherein a baffle is positioned on said periphery adjacent said inlet port so as to direct a fluid stream fed through said inlet port towards said first wall.

8. The hollow valve disc of claim 6 wherein the width of said channel is substantially the same dimension as the spacing between adjacent concentric spaced walls.

9. The hollow valve disc of claim 8 wherein said plurality of concentric spaced walls consists of a pair of concentric walls extending from said first wall towards said periphery and in a spaced circular path from said periphery terminating in spaced relation to said second wall, and an opposed concentric wall extending intermediate said pair extending from said second wall and in a spaced circular path terminating in spaced relation to said first wall.