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J. C. SANDILANDS

2,359,442

METHOD OF MAKING DISK ELEMENTS FOR GATE VALVES

Filed June 14, 1943

2 Sheets-Sheet 1

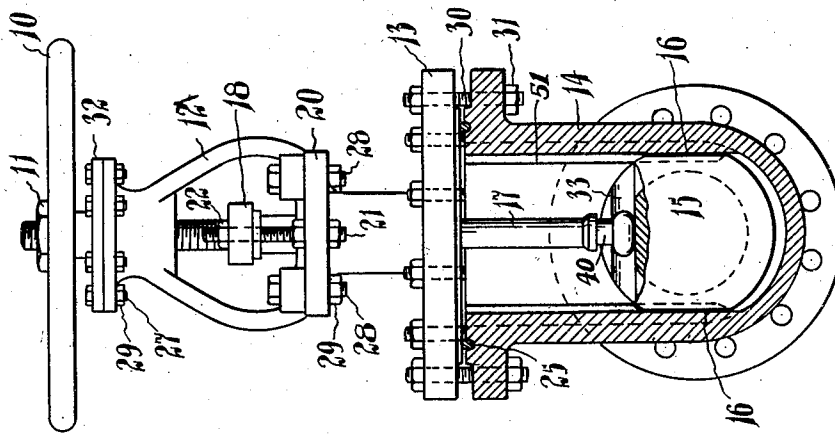


FIG. 2.

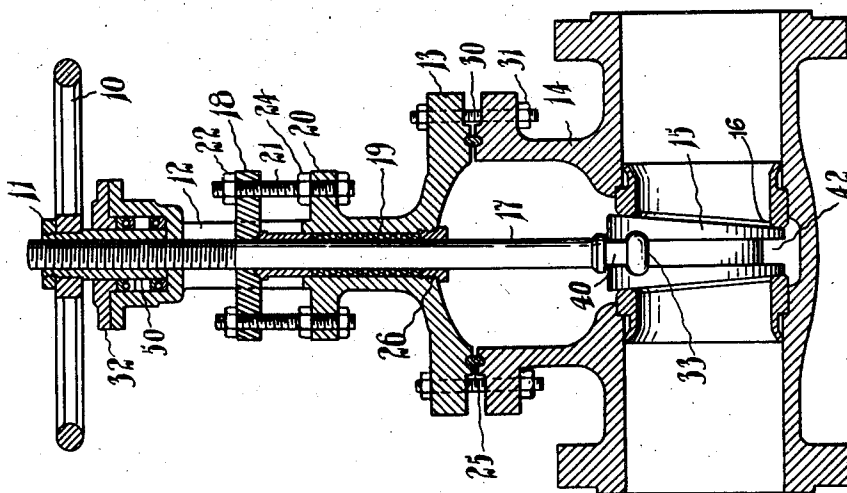


FIG. 1.

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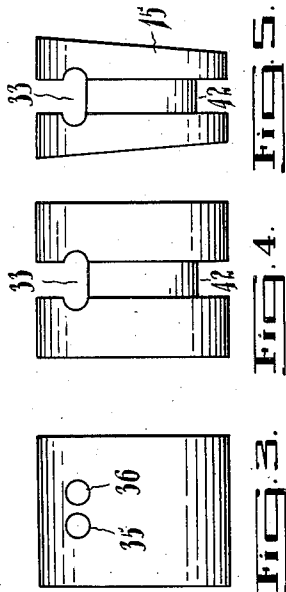
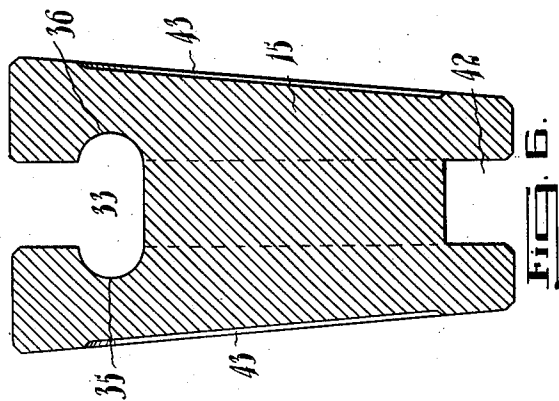
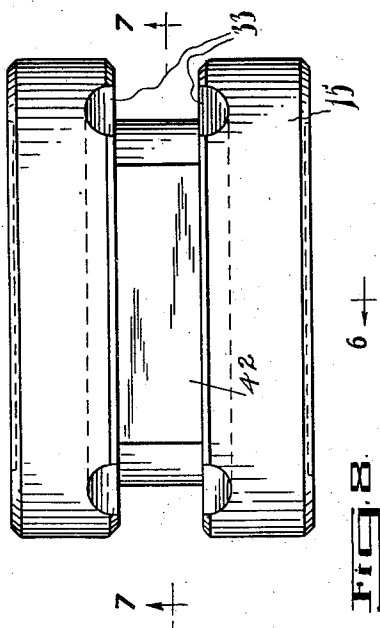
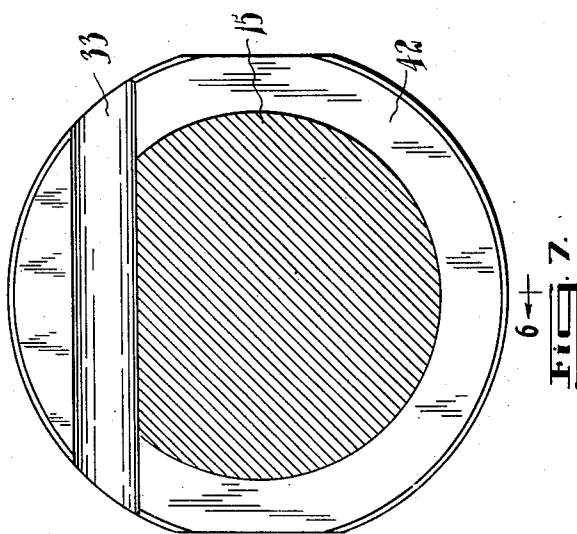
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METHOD OF MAKING DISK ELEMENTS FOR GATE VALVES

Filed June 14, 1943

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,359,442

METHOD OF MAKING DISK ELEMENTS FOR
GATE VALVES

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3 Claims. (Cl. 29—157.1)

This invention relates to gate valves and is particularly directed to providing a simplified method of forming the disk or gate element thereof.

In the manufacture of gate valves, the disk or gate element is usually made either by casting the metal into approximately the desired shape followed by machining operations, or by die forging and machining. These methods have the disadvantage of increasing the cost of manufacturing the disk as a result of wastage due to defects in the castings or forgings and due to the amount of precision machining work necessary to complete the disk after casting or forging.

It has been found that the disk elements for such valves can be easily and economically manufactured in an easily executed sequence of operations conducted in inexpensive production tools from readily available bar stock whereby substantial savings can be effected in the number of operations, and in the labour and tools involved in the manufacture of such elements.

One of the primary objects of this invention is to provide a method for making the disk or gate elements for gate valves whereby the elements are formed from readily available bar stock by an easily executed sequence of operations involving inexpensive tools.

The method of the present invention includes the steps of cutting a disk of predetermined thickness from the bar stock, drilling two holes transversely through the disk approximate to the periphery and parallel to and between the faces thereof, the holes being spaced apart equidistant from the centre line of the thickness of the disk, cutting out the core of metal between the vertical axes of the holes and the periphery to form a V-shaped slot extending parallel to and between the faces of the said disk and from the periphery to the base of said holes, and forming a seat finished surface on the sides of said disk, said sides tapering uniformly from the top of said disk to the base thereof.

An understanding of the manner in which the above and other objects of the invention are attained may be had from the following description, reference being made to the accompanying drawings, in which:

Figure 1 is a side elevation in section of a gate valve incorporating a disk or gate element constructed in accordance with the method of the present invention;

Figure 2 is a front elevation partly in section of the valve illustrated in Figure 1;

Figures 3, 4 and 5 illustrate the stages of manufacturing the disk;

Figure 6 is end section on the line 6—6 of Figure 7;

Figure 7 is a section on the line 7—7 of Figure 8; and

Figure 8 is a top plan view of the valve disk shown in Figure 7.

Like reference characters refer to like parts throughout the specification and drawings.

With the exception of the disk or gate element, the gate valve illustrated in Figures 1 and 2 is of standard design.

The gate valve includes, in general, a valve body 14; a bonnet secured to the valve body by the stud bolts 30 and nuts 31; and a gasket 25 serving to seal the joint between the valve body and the bonnet.

The upper end of the bonnet 13 terminates in a collar or gland plate 20 which, by means of the lower yoke stud bolts 28, carries the yoke 12, the upper end of which is secured to a flange 32 by means of the upper yoke stud bolts 27.

A valve stem 17 extends through the yoke and bonnet and into the valve body. A handwheel 10, secured in place by a locking nut 11, is carried on the upper end of the yoke nut 50 which engages the upper end of the valve stem and which extends above the flange 32 for that purpose. The lower end of the valve stem is shaped to engage snugly in the V-shaped slot 33 formed in the upper part of the valve disk or gate element 15.

The valve body is provided with spaced apart, smooth finished, tapered seats 16 in which the valve disk is movable in a vertical plane. The sides of the disk are tapered inwardly at an angle of about 10° from the top to the bottom and formed with a very smooth tapered finish to correspond with the tapering of the seats 16 and to seat snugly therein.

The upper end of the valve stem is threaded to engage in the internal threads of the yoke nut 50, whereby, on rotation of the yoke nut by the handwheel 10, the valve disk 15 is respectively raised or lowered in its seat 16. The valve stem is suitably packed, as indicated, by the gland 19, to prevent the escape of fluid through the assembly.

The method of forming the valve disk or gate element constitutes the principal feature of the present invention and is described in detail hereinafter and illustrated in Figures 3 through 7.

The disk is formed from bar stock, the metal being such as to be substantially resistant to cor-

rosion or erosion by the fluid to which it is exposed. Under normal circumstances, it is preferred to use an alloy such as brass or a stainless steel. The bar stock used, of course, is of a diameter only slightly greater than the greatest dimension of the disk desired, to avoid unnecessary waste of metal.

At the time of cutting a disk of predetermined thickness, the outer perimeter of the disk can be faced to form, in a single operation, a disk of circular section in which the faces are true and the periphery finished. The disk is then drilled to form the holes 35 and 36. The holes are drilled below the top of the disk and spaced apart equidistant from the centre line. These holes are drilled transversely through the disk and parallel to and between the faces thereof.

After drilling the holes 35 and 36, the disk is then put in a lathe and the core of metal between the vertical axes of the holes 35 and 36 is cut out to form, with the holes, the T-shaped slot 33 in which the lower end of the valve stem is received in a snug fitting relationship.

The sides of the disk are tapered uniformly from the top to the base thereof, to fit snugly into the correspondingly tapered seat 16. The tapered sides of the disk are preferably finished with a seat finish.

The lower end of the valve stem 17 is formed with a narrowed neck portion 40 to form an inverted T-shape which fits into the T-shaped slot 33 in a snug fit.

As a specific modification of a disk for a 6 inch gate valve formed in accordance with the present invention, a disk approximately $4\frac{1}{2}$ inches thick is cut from bar stock about $7\frac{1}{2}$ inches in diameter. The holes 35 and 36 are drilled 1 inch in diameter, the centres being spaced $1\frac{3}{8}$ inches below the periphery and $\frac{3}{64}$ inches on each side of the long axis of the thickness of the disk. The core of metal, approximately $1\frac{3}{8}$ inches wide between the centres of the holes 35 and 36, is then cut out from the periphery to the base of the holes. At the time of cutting, a slot 42 is cut around the periphery of the disk, the formation of which is incidental to the forming of the T-shaped slot. The slot 42 forms a guide slot which is engaged by the vertical guides 51 formed internally in the valve body. The single machining operation described above, therefore, forms two essential parts of the disk.

At the time of cutting the disk from the bar stock, the faces of the disk can be cut precisely true and the periphery machined to form a surface of exactly circular section, which procedure simplifies the machining operation necessary to impart the proper tapering of the sides and provide a smooth seat finish thereon. The taper of the sides is ordinarily about 10° from the top to the base. The sides of the disk may be indented slightly, as indicated by the numeral 43, for ease in raising and lowering the disk out of and into its position in the seat 16.

I have found it possible to make substantial

savings in the cost of manufacturing disks for gate valves by the method described hereinabove. There is no wastage of material other than the relatively small amount in the drilling and machining operations. The various operations can be conducted in inexpensive machinery without undue wear thereon. The resulting disk is highly satisfactory in use, being at least the equivalent of a disk made without defect by casting or by forging.

It will be understood, of course, that modifications may be made by others skilled in the art to the described steps of the method of the present invention in the light of the teachings herein, without departing from the scope of the invention as defined in the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. The method of making a disk element for a gate valve which comprises cutting a circular disk of predetermined thickness from bar stock, drilling two holes transversely through the disk approximate to the periphery and parallel to and between the faces thereof, the holes being spaced apart equidistant from the centre line of the disk, cutting out the core of metal between the vertical axes of the holes and the periphery to form a T-shaped slot extending parallel to and between the faces of the said disk and from the periphery to the base line of said holes, and forming a seat finished surface on the sides of said disk, said sides tapering uniformly from top of said disk to the base thereof.

2. The method of making a disk element for a gate valve which comprises cutting a circular disk of predetermined thickness from bar stock, drilling two holes transversely through the disk approximate to the periphery and parallel to and between the faces thereof, the holes being spaced apart equidistant from the centre line of the disk, cutting out the core of metal between the vertical axes of the holes and the periphery to form a T-shaped slot extending parallel to and between the faces of the said disk and from the periphery to the base line of said holes, the formation of said T-shaped slot simultaneously forming a guide slot around the periphery of the disk, and forming a seat finished surface on the sides of said disk, said sides tapering uniformly from the top of said disk to the base thereof.

3. The method of making a disk element for a gate valve which comprises cutting a disk of predetermined thickness from bar stock, drilling two holes transversely through the disk approximate to the periphery, and parallel to and between the faces thereof, the holes being spaced apart equidistant from the centre line of the disk, and cutting out the core of metal between the vertical axes of the holes and the periphery to form a T-shaped slot extending parallel to and between the faces of the said disks, and from the periphery to the base line of said holes.

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