G. J. BRYEN.

METHOD OF MAKING VALVES.

APPLICATION FILED MAY 13, 1915.

1,145,114.

Patented July 6, 1915.

2 SHEETS—SHEET 1.

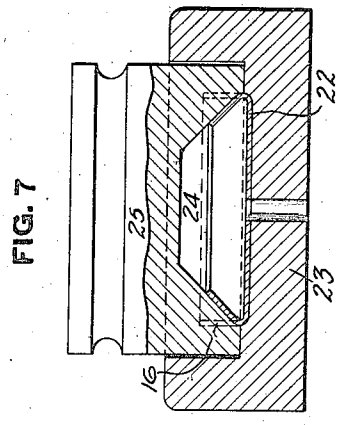


FIG. 7

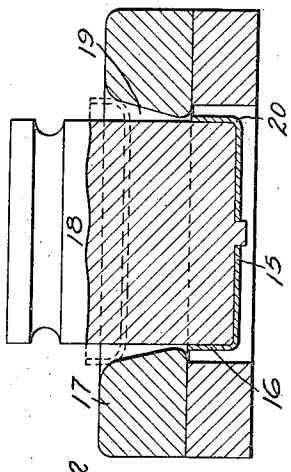


FIG. 6

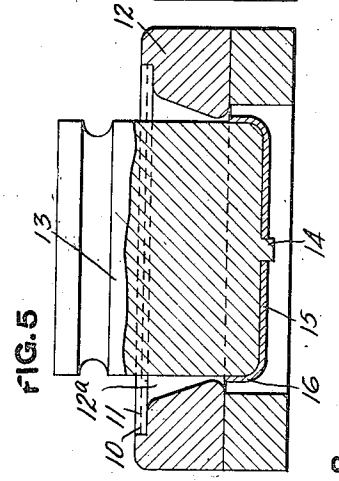


FIG. 5

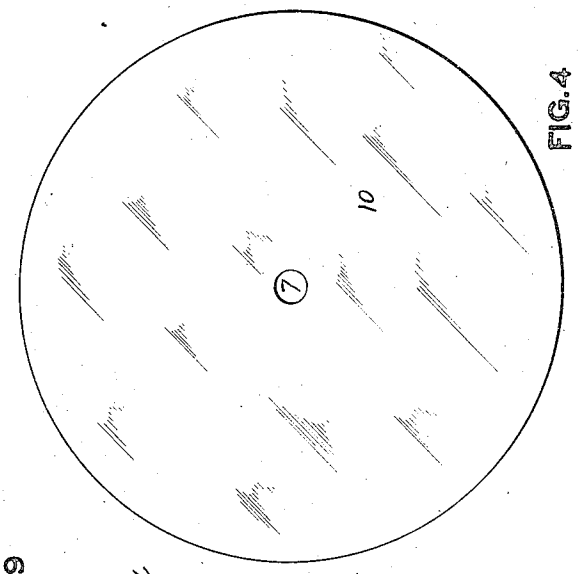


FIG. 4

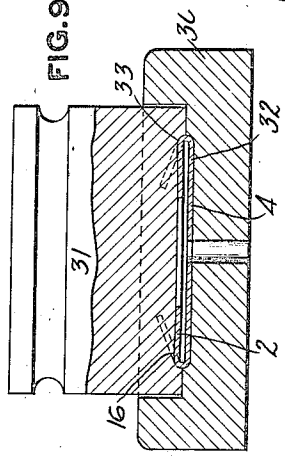


FIG. 9

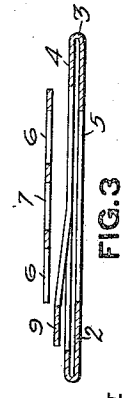


FIG. 3

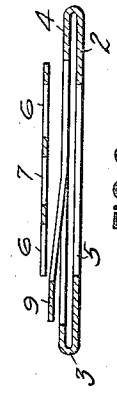


FIG. 2

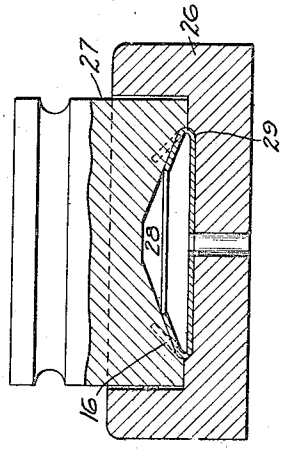


FIG. 8

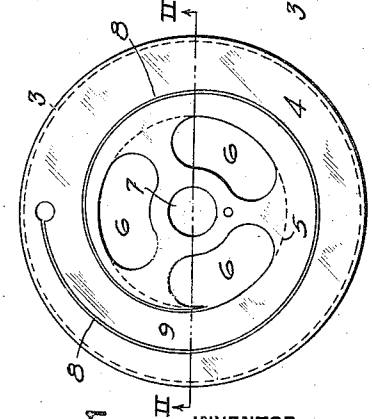


FIG. 1

WITNESSES

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2 SHEETS—SHEET 2.

FIG. 10

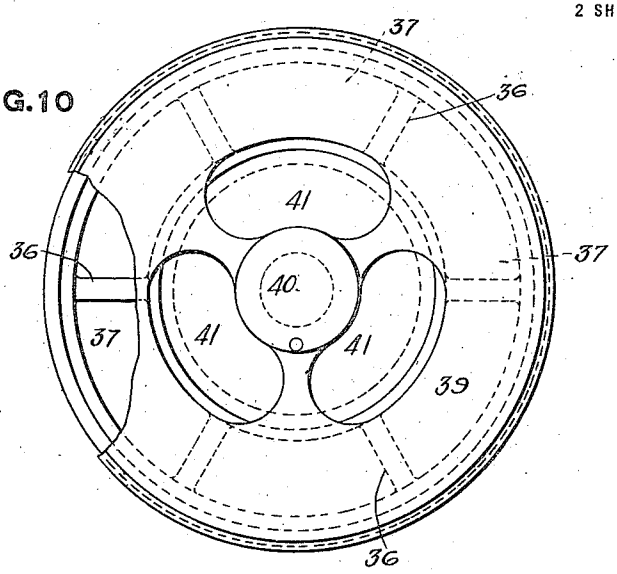


FIG. 12

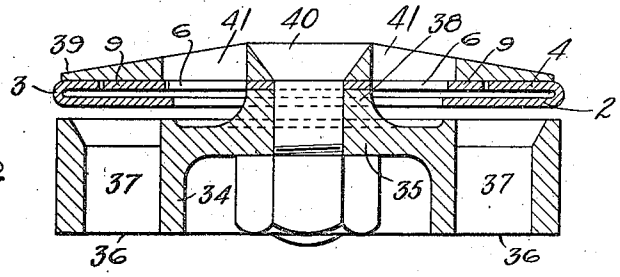
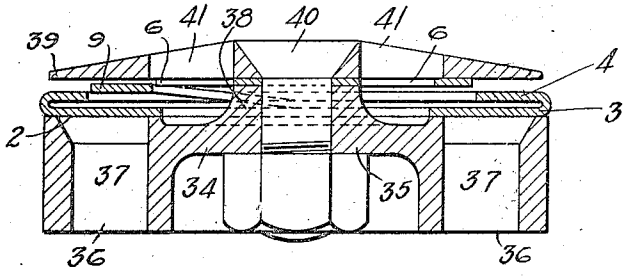


FIG. 11



WITNESSES

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METHOD OF MAKING VALVES.

1,145,114. Specification of Letters Patent. Patented July 6, 1915.

Original application filed February 27, 1915, Serial No. 10,963. Divided and this application filed May 13, 1915. Serial No. 27,810.

To all whom it may concern:

Be it known that I, GEORGE J. BRYEN, a citizen of the United States, and resident of Duquesne, Allegheny county, Pennsylvania, have invented a new and useful Method of Making Valves, of which the following is a specification.

My invention has relation to the manufacture of valves of the class used on compressors, blowing engines, and similar apparatus employed in compressing air or other gaseous fluid, and while not restricted to such use, more particularly relates to the class or type of valve employing a spring in seating the valve, such as is shown in my co-pending application, Serial No. 10,963, filed Feb. 27, 1915, of which this application is a division.

One object of this invention is the provision of a novel method of making valves whereby laminary valves having the desired characteristics and improved qualities are made possible, and an economically manufactured valve is produced.

Another object of my invention is to provide a method of making laminary valves of improved construction wherein the parts of the valves, including the spring therefor, are formed integrally from a flat metal disk.

Still further objects of my invention will become apparent as it is to be more fully described hereinafter and specifically pointed out in the appended claims.

Referring now to the accompanying drawings forming part of this specification, Figure 1 is a plan showing a laminary valve as made in accordance with my invention. Fig. 2 is a sectional side elevation showing the laminary valve of Fig. 1, the section being taken on the line II—II of Fig. 1. Fig. 3 is a sectional side elevation similar to that of Fig. 2, showing a modified form of laminary valve constructed in accordance with this invention. Fig. 4 is a plan showing the outline of the thin flat metal blank from which the valves of Figs. 1, 2, and 3 are made, preparatory to the first forming step of my improved method. Fig. 5 is a sectional side elevation showing the blank at the completion of the first forming or cupping step, and the forming dies employed in this step of my improved method. Fig. 6 is a similar side elevation showing the blank at the completion of the next step of the method, and the dies employed therewith. Fig. 7 is a sectional side elevation, similar to that of Figs. 5 and 6, showing the blank as formed in this step of my method, and the dies employed in connection therewith. Fig. 8 is a similar sectional side elevation showing the next step of forming the cupped blank, and the dies used in carrying out this step of my improved method. Fig. 9 is a sectional side elevation similar to that of Fig. 8 showing the final bending step employed in forming the cupped blank, and the dies used in this step of my method. Fig. 10 is a plan showing a valve, valve seat, and valve stop, as assembled for use. Fig. 11 is a sectional side elevation showing the assembled valve, valve seat, and valve stop, the valve being shown in seated or closed position. Fig. 12 is a sectional side elevation similar to that of Fig. 11, the valve being shown in lifted or open position instead of in closed position, as in Fig. 11.

As will be seen in Figs. 1 and 2, the laminary valve comprises a layer 2 forming the seat of the valve, which is integrally joined at its periphery 3 to the layer 4. A central opening 5 is provided in the layer 2, and a plurality of openings 6 surround the smaller central opening or hole 7 in the layer 4. A spiral groove 8 is provided in the layer 4 between the holes 6 and the periphery 3 of the valve so as to form a spring 9 by which the valve is seated and is yieldingly held in seated position.

In the valve shown in Fig. 2 the lower layer or seat 2 of the valve extends parallel with the top layer 4, and is slightly separated therefrom. In the valve shown in Fig. 3 the top layer 4 and lower layer 2 are pressed closely together and may be pressed into close contact adjacent to the periphery 3 thereof, the valves of these figures otherwise being similar in construction.

In making the valve of Figs. 1 and 2 in accordance with my improved method, forming part of this invention, a sheet of steel or alloy steel, of the desired composition, is cut to form a circular disk 10 of the required diameter and the axially central hole 7 is provided therein. The disk 10, preferably after being heated, is then placed in the counterbored depression or recess 11 in the top face of the lower die 12 of the pair of dies 12 and 13 shown in Fig. 5. The top die 13, which has a projection 14 on its lower face (to enter the central opening 7 in the

disk) is then caused to force the flat disk 10 through the opening 12a in the lower die 12 and form the disk into a cupped blank having a flat end 15 with a cylindrical flange 16 on its periphery. The cupped blank, formed in the operation which has just been described, is then placed in position on the bottom die 17 of the second set of dies, 17 and 18 (as is shown in dotted lines in Fig. 6). The top die 18 is then actuated to force the cupped blank through the opening 19 in the bottom die 17, this operation squaring or further shaping the blank by reducing the size of the fillet 20 connecting the cylindrical flange 16 with the flat end 15 of the blank, and increasing the width or height of the flange 16. The blank formed in the dies of Fig. 6 is then removed to a third set of dies (shown in Fig. 7) and after placing the blank in the recess 22 of the bottom die 23, the frusto-conical recess 24 in the face of the top die 25 of this set is brought into position extending substantially at an angle of 45 degrees to the horizontal. The now frusto-conical flange 16 will be upset or thickened somewhat in this step of the valve forming operations. The blank is then removed to the next set of dies 26 and 27 (shown in Fig. 8) in which the flange 16 is further bent or flattened by the frusto-conical recess 28 in the top die 27 while the blank is supported in the recess 29 in the bottom die 26 so as to extend at an angle somewhat less than 45 degrees to the horizontal. The blank of Fig. 8 is then transferred to another set of dies 30 and 31 having registering recesses 32, 33, and the inwardly inclined flange 16 which ultimately forms the lower layer or seat 2 of the valve, is then pressed inwardly within these recesses until its outer face extends parallel to the outer face of the other layer of the valve which forms the top layer 4 in the finished valve. In this operation, the two layers 2 and 4 are not forced closely into engagement, so as to form the valve of Fig. 2.

When it is desired to make a valve like that shown in Fig. 3, the blank is taken from the dies of Fig. 8 to a modified form of dies similar to those shown in Fig. 9, having recesses 32, 33, arranged to press the adjacent faces of the two layers 2 and 4 of the metal forming the valve into close contact, as is shown in the valve of Fig. 3. The valves, after being formed in this way, are then faced on the valve seat layer 2, the spiral groove 8 is cut to form the spring 9, and the openings 6 are provided in the top layer 4 of the metal forming the valve, the spring 9 forming the means by which the valve is seated and yieldingly held in seated or closed position on the adjoining face of a valve grid. After the spiral groove 8 is provided in the valve the metal forming the spring 9 is bent upwardly so as to give it a permanent set, and cause it to remain in the separated position shown in Figs. 2 and 3, so that when the valve is secured in assembled position later, as shown in Figs. 10 and 11, the spring 9 will act to hold the layer 2 of the valves in closed position, as shown in these figures. The valve is then tempered, and if necessary, the seating face of the bottom layer 2 of the valve is machined or faced, and the valve is in readiness to be assembled for use.

The valve grid 34 (see Figs. 11 and 12) which is of ordinary known construction, has a hub or center 35 and an outer ring connected to the hub 35 by radial arms 36. Openings 37 in the valve grid between the arms 36 provide passages for the discharge of air or other gaseous fluid through the valve grid 34. The spring 9 formed in the top layer 4 of the valve is secured at its center on top of the boss 38 on one side of the hub or center 35 of the grid, and a stop 39 is provided above the valve to limit its upward or opening movement. A bolt 40 extends through the opening 7 in the valve spring 9, and registering openings in the center of the valve grid 34 and stop 39, to hold the parts in assembled relation, and the valve stop 39 is provided with a plurality of openings 41 which register with the similarly shaped openings 6 in the top layer 4 of the valve. A series of the grids 34, each having a valve and valve stop in assembled position thereon, are assembled in the heads of the cylinder of the compressor, blowing engine, or other apparatus, in the usual known manner.

The advantages of my invention will be apparent to those skilled in the art. A valve of improved wearing qualities and increased strength and rigidity is provided without any, or with slight, increase in the cost of manufacture. By means of my improved method the valve is easily and quickly made.

Modifications in the method of making the valve, and in the constructional details of the valve may be made without departing from my invention as defined in the appended claims. The number of bending steps employed may be lessened or increased, and the valves may be formed by spinning the flat disks instead of by bending dies in a series of bending steps, as illustrated and described. The spiral groove in some cases may be provided before bending the disks, a plurality of grooves may be used, and other variations in the valves and method of forming the valves may be made within the scope of the claims.

I claim:—

1. The method of making circular laminary valves which consists in cupping a flat circular disk to form a peripheral flange

thereon, bending the flange inwardly into parallelism with the bottom of the cupped blank, and slitting one of the so-formed layers to form a spring on said valve.

2. The method of making circular laminary valves which consists in cupping a flat circular disk to form a peripheral flange thereon, bending the flange inwardly into parallelism with the bottom of the cupped blank, forming registering openings in the opposite faces of the layers of the valve, and slitting one of the so-formed layers to form a spiral spring on the valve.

3. The method of making circular laminary valves which consists in cupping a flat circular disk to form a peripheral flange thereon, bending the flange inwardly into parallelism with the bottom of the cupped blank, forming registering openings in the opposite faces of the layers of the valve, slitting one of the so-formed layers, and bending the slitted layer to give the so-formed spring a permanent set.

4. The method of making circular laminary valves which consists in cupping a flat circular disk to form a peripheral flange thereon, bending the flange inwardly into parallelism with the bottom of the cupped blank, forming registering openings in the opposite faces of the layers of the valve, slitting one of the so-formed layers, bending the slitted layers to give the so-formed spring a permanent set, and then tempering the valve and spring.

In testimony whereof, I have hereunto set my hand.

GEORGE J. BRYEN.

Witnesses:

J. BYRON NEWMEYER,

C. G. GUYATT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."