

March 6, 1934.

J. VERDERBER ET AL

1,949,592

VALVE PRODUCTION METHOD

Filed Aug. 15, 1930

3 Sheets-Sheet 1

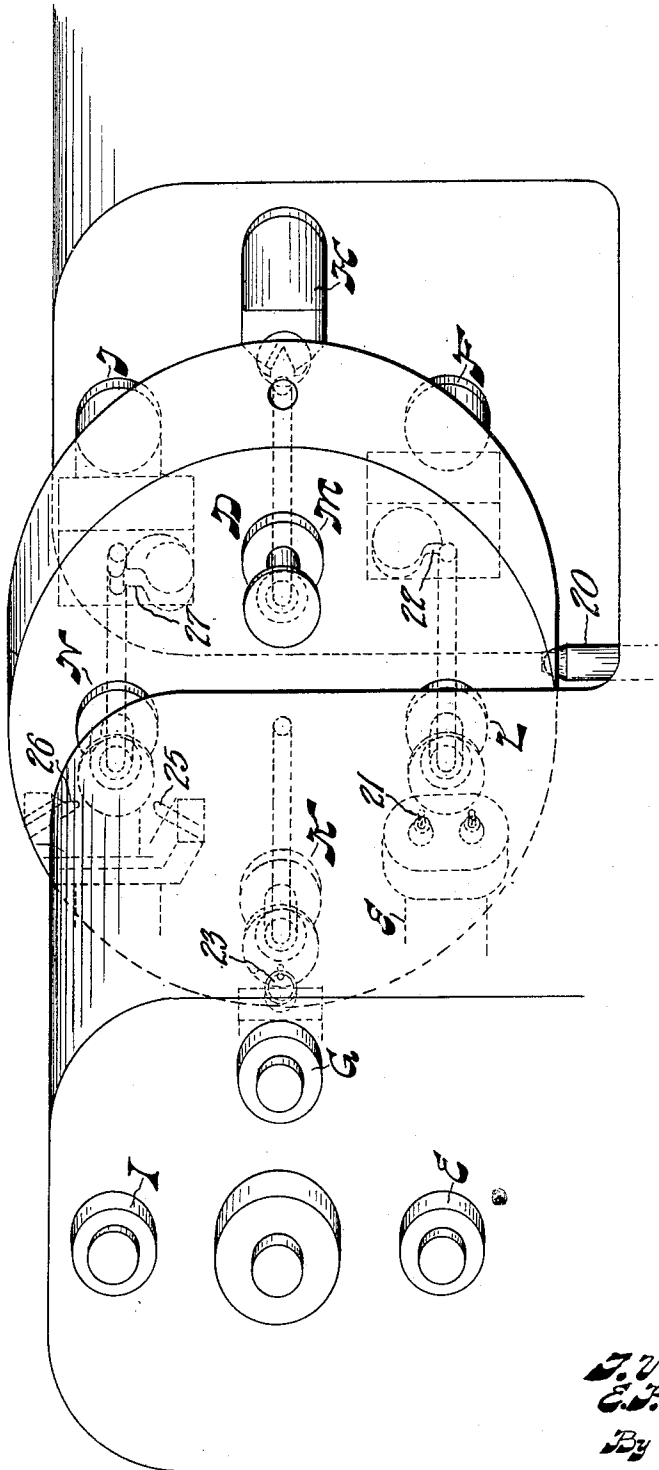


Fig. 2

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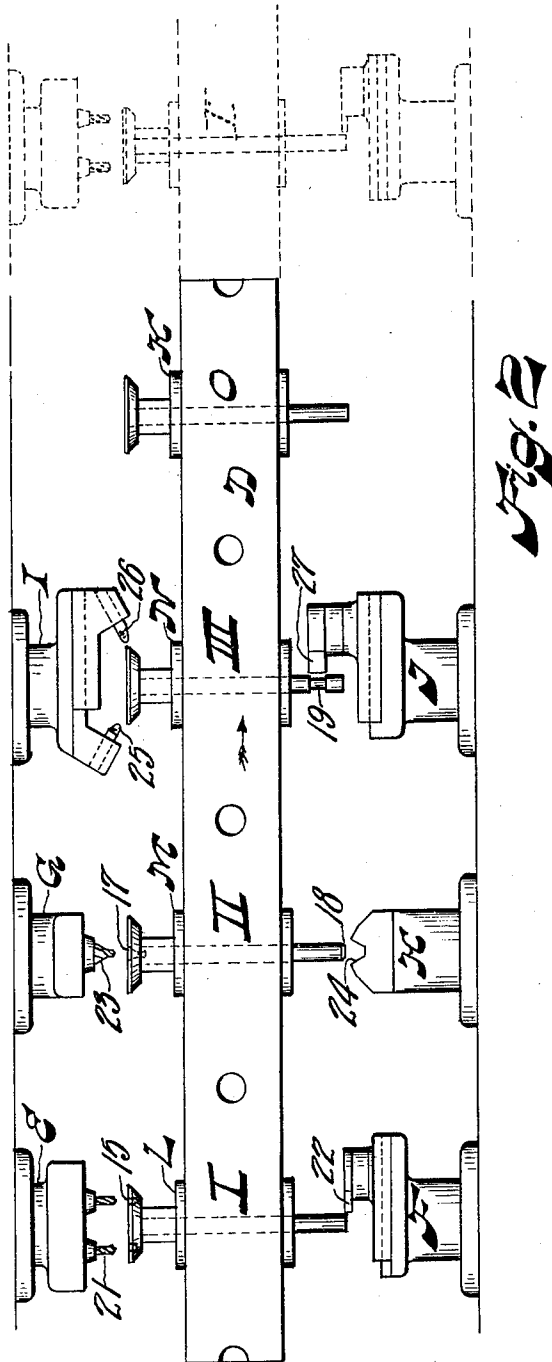
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VALVE PRODUCTION METHOD

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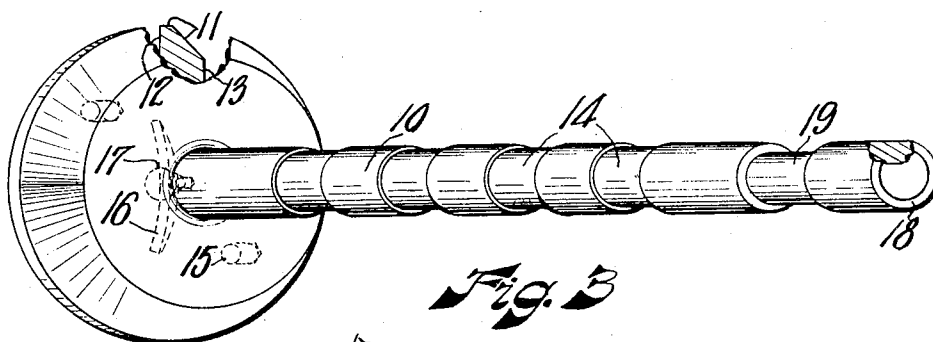
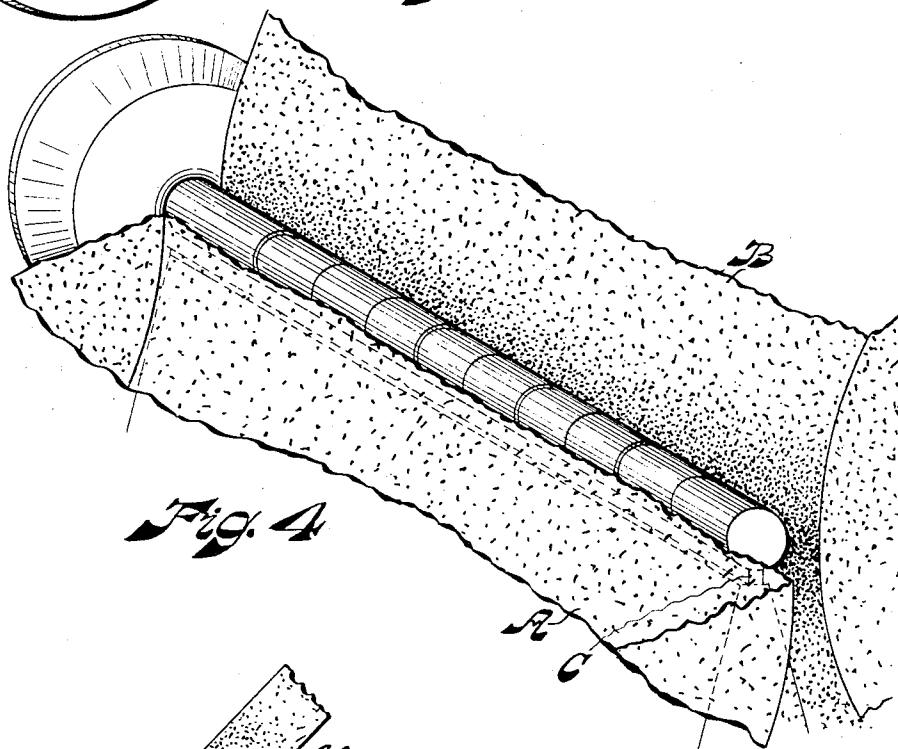
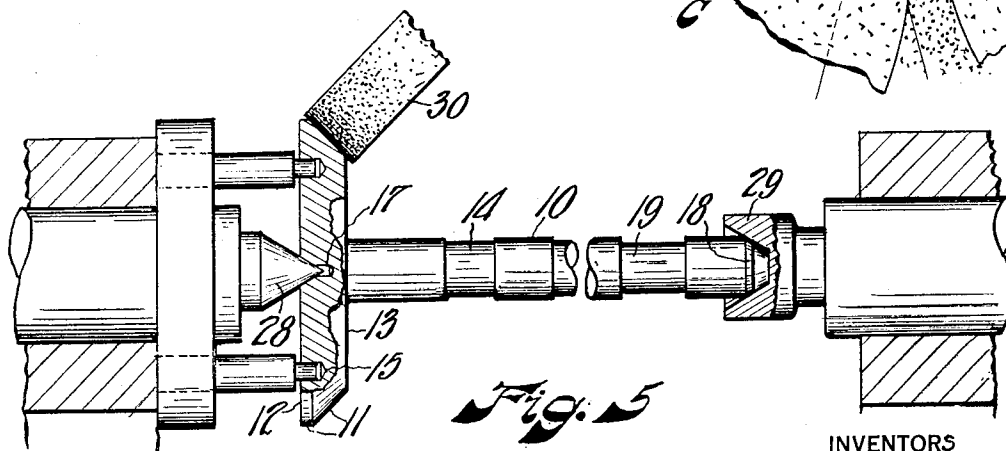
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VALVE PRODUCTION METHOD

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3 Sheets-Sheet 3



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VALVE-PRODUCTION METHOD

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Application August 15, 1930, Serial No. 475,600

5 Claims. (Cl. 29—156.7)

Our invention relates to methods of forming and machining valves.

The object of our invention is economic production of valves.

5 In valves, such as poppet valves, it is quite desirable that economic production thereof is attained and that important surfaces thereof are true with each other.

Our invention aims to co-ordinate the steps for
10 production of valves in such a manner that the most economic production thereof is attained and the important surfaces thereof are true with each other so that valves fit into their positions without manual fitting except the grinding in which is
15 invariably required to produce a good fit between the valve and its seat.

In order to assist in the illustration of our invention, we present herewith drawings illustratively and diagrammatically showing how
20 mechanism may operate to attain the steps of our invention specifically described herein.

In the accompanying drawings mentioned:

Fig. 1 is a perspective view of a possible device showing illustratively and more or less diagrammatically arrangements of tools useful in carrying
25 out our method.

Fig. 2 is a diagrammatical view showing one development of a blank through a group of machining steps of our invention as specifically described herein.
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Fig. 3 is a perspective view of a finished valve.

Fig. 4 is a perspective view of the machining part of a centerless grinder.

Fig. 5 is a sectional view of the machining part
35 of a finish grinder with valve centering means.

Similar reference characters refer to similar parts throughout the views.

One manner of carrying out our invention, illustratively setting forth our invention, is explained herein specifically; reference being made generally to mechanisms, suggestively shown in the accompanying drawings, adapted for carrying out the specific method described herein.

One type of finished valves is shown in Fig. 3
45 and one method for production thereof is described herein specifically referring to possible mechanism for such production.

A blank is first formed for the valve shown and this blank has finishing stock on the diametrically
50 larger parts 10 of the stem thereof and on the valve portion 11 of the head thereof and on the outer end of the stem thereof. The valve may be first formed by any suitable means. Our invention mostly concerns the machining means and
55 method of valves.

The surfaces 12 and 13 are not to be finished on this valve although ample provision is available on the mechanism shown for finishing these surfaces also when desired.

The diametrically reduced parts 14 of the stem 60 are formed to final size in the blank preferably a little smaller diametrically than the final finished size of the parts 10 and are not intended to be machined although stock for machining may be provided thereon and machined with the parts 10
65 if desired.

Upon completion of formation of the blank, the same may be heat treated if desired.

Upon completion of the blank formation and the heat treating if used at this stage of valve
70 production, the stem may be machined to a diametrical finishing size (leaving stock for final machining to finish size) or may be machined to the final finish size (leaving stock for final grinding) as desired or as may be desirable for various
75 valves or valve productions.

For economic production of valves, we prefer to use a centerless grinder, well known in the art; the operating part of one of such machines is illustratively shown in Fig. 4.
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The blank is placed in between the two rotating grinding wheels A and B and rests or is vertically supported on the support C as shown in Fig. 4 so that rotation of the grinding wheels rotates the blank on its axis as well as grinds the
85 stem as is well understood in such machining in such devices.

In this instance, only the parts 10 of the stem are machined, leaving the parts 14, originally formed to final size, as rough formed and thereby
90 facilitating the machining operation on the parts 10.

It is, of course, quite obvious that the stem can be machined by cutting tools, such as are used in lathes and the like but this procedure requires either centers or chucking or other holding means as well as rotating means and is recommended only when a centerless machining device is not available or cannot be used. This cutting tool procedure requires more time as compared
95 with the abrading tool procedure and should be used only when the latter cannot be used. The cutting tool procedure is a more advantageous step in economic production of valves when a large amount of stock is to be removed.
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Upon completion of the machining of the stem, the blank is removed from the centerless grinder for further machining thereof.

Upon removal of the blank from the grinder, the blank is placed into a device for automatically
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performing a grouped series of machining operations thereon.

Such a device (shown in Figs. 1 and 2) includes a turret like element designated D and the machining spindles E, F, G, H, I, and J each having the necessary driving and feeding means therefor and for tools thereon.

The turret is rotatable and indexable into four positions so that blanks held therein can be presented successively for operation thereon by tools on the spindles.

This group of steps is intended to perform machining operations as follows:

Drill driving holes 15 or mill driving slots 16 in the outer end of the head and cut the stem to length;

Drill a centering hole 17 into the head if driving holes are used in the head but drill the centering hole in the first step and mill the driving slot in this step and also provide the chamfer 18 for future centering of the blank;

Machine the head to diametrical size and machine the valve face and provide the groove 19 in the stem;

And loading and unloading the turret.

The turret has four collet mechanisms K, L, M, and N exchangeable for valve stems of different sizes and lengths and is automatically indexable into four positions by mechanism operated by the driving mechanism of the device between the steps of this group of machining operations and is held in these positions by the index mechanism 20 automatically operated by the driving mechanism of the device and set into indexing motion upon completion of each machining operation of this group.

For the purpose of conveying a clear idea of our invention we have presented Fig. 2 in the drawings and have designated the loading and unloading station as O, the first machining step as at station I, the second machining step as at station II, and the third machining step as at station III.

After the blank arrives at station I, the drills 21 are automatically rotated and fed by the machining spindle E to drill the driving holes into the valve head while the cutting off tool 22 in the machining spindle F automatically cuts the valve stem to desired length; the centering drill 23 in the spindle G is automatically rotated and fed to provide the centering hole in the head of the valve and the chamfering tool 24 in the spindle H is operated and fed to chamfer the end of the stem to provide a centering means for a hollow or bell center; the tools 25 and 26 in the spindle I are operated and fed to machine the outside diameter of the head and the angular face of the head and the forming tool 27 in the spindle J is operated and fed to machine the groove 19 in the stem.

Upon one completion of this group of steps, the turret is automatically indexed, advancing each blank to the next station where the above describing operations are repeated and this process continues as long as the device is in operation.

At each indexing of the turret, the blank then at station III moves to the station O and is there released automatically upon completion of the indexing movement of the turret and is automatically held released while the turret remains stationary and while the tools are performing their functions on the blanks at the other stations and locked automatically upon commencement of the next indexing operation of the turret.

While the turret is stationary, between the indexing operations, the operator removes the re-

leased blank at station O and replaces the same with a rough blank to go through the indexing and machining operations described and this loading and unloading and successive machining is continued as long as the machine or device is in operation.

When the blank arrives at station O, the collet mechanism opens automatically and thereby releases the blank from its grip by the mechanism and the operator removes the blank from the turret and places another blank into the mechanism while the tools are performing machining operation on each one of the other blanks held in the turret.

When all machining operations are completed, the turret operating mechanism releases the index pin and indexes the turret in the direction of the arrow and thereby moves the blank from station O to station I, another blank from station I to station II, another blank from station II to station III, and another blank from station III to station O, and then locks the turret in this indexed position upon completion of the indexing.

As the turret is so indexed the collet mechanism is first released to release the blank previously in the collet now at station O, the operator then removes the machined blank in this collet and puts a rough blank into its place for indexing thereof to station I in the next indexing operation and this collet grips the blank and holds it in the turret when the same is indexed from station O to station I and retains the hold through the stations I, II, and III.

In this manner, this group of machining operations is performed automatically and a blank is released automatically at each indexing of the turret.

Upon completion of this machining operation, the blank may be heat treated, for hardness or otherwise if desired.

The stem may then be machined to final size, preferably in a centerless grinder, as shown in Fig. 4, if stock has been allowed for finish machining in the first stem machining operation.

The blank may then be placed into machining device (Fig. 5) having a center 28 for the centering hole in the head of the valve and a cup center 29 for the chamfered end of the stem and a machining tool, illustrated by the grinding wheel 30, for finish machining the valve seat on the head if desired.

The end of the stem may also be further machined, preferably by grinding, to provide a better contact surface for the push rod for such valves.

It appears to be obvious that the means and steps can be varied, one or more omitted when unnecessary on certain valves, and means and steps can be added such as smoothing unmachined surfaces.

In the manner set forth herein valves can be produced most economically.

We are aware that changes and modifications can be made in the means and steps set forth herein, that some means and steps mentioned herein can be omitted when desired and that other obvious means and steps can be added or changed or modified when desired within the spirit and intent and scope of our invention and the appended claims; therefore, without limiting ourselves to the precise means and the precise order and number of steps as shown and described.

We claim:

1. A valve production method including machining the stem of a blank for a valve, gripping

the machined stem and leaving both ends thereof exposed, moving the blank from station to station to present the ends thereof to tool means at stations, machining a driving recess into the head of the blank and cut stem to length while the blank is at one of the stations, machining centering means on the ends of the blank while the same is at another one of the stations, machining the head of the blank and groove the stem thereof while the same is at another one of the stations, and release the machined blank and grip a new blank while at the final station.

2. A valve production method including forming a blank for a valve, machining the stem of the blank, gripping the stem and leaving both ends of the blank exposed, automatically moving the so gripped blank into indexed positions, and automatically bringing tool means into operation on the ends of the blank while the same is so gripped to machine the blank to length, machine driving depressions into the head of the blank, machine center means on the ends, machine the head of the blank, and form a groove in the stem.

3. A valve production method including forming blanks for valves up to machining the heads and the ends thereof, grouping tool elements to simultaneously operate on both ends of each of the blanks, automatically gripping the so formed blanks successively and leaving both ends thereof exposed, automatically and successively moving the so gripped blanks into presence of the tool elements, and automatically machining both ends of each blank simultaneously, including centering means for use in later machining opera-

tions on the blanks, and in succession of one blank after another.

4. A valve production method including forming blanks for valves, machining the stems of the blanks, automatically and successively gripping each of the so formed and so gripped blanks and leaving the ends thereof exposed and by this gripping centralizing each blank successively, grouping machine elements to operate simultaneously on both ends of each blank while the same remains so gripped, including centering means for future use of machining the blank, and heat treating the blanks either before or after machining thereof as desired.

5. A valve production method including forming a blank for a valve with relief portions in the stem thereof, machining the stem in a centerless machining device, automatically gripping the blank by the stem thereof in a device adapted to be indexed and leaving both ends thereof exposed, grouping machining elements to simultaneously operate on both ends of the so gripped blank, automatically indexing the index device to present both ends of the blank to tool elements, automatically operating the tool elements and thereby simultaneously machining both ends of the blank, including a centering means, while the same remains so gripped, automatically releasing the blank, hardening the blank if desired, again machining the stem of the blank in a centerless machining device, and positioning the blank by the centering means for further machining other parts of the blank.

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