No. 682,368. Patented Sept. 10, 1901.

F. L. SMITH.

COMBINED GATE AND GLOBE VALVE RESEATING MACHINE.

(Application filed Nov. 28, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 2.

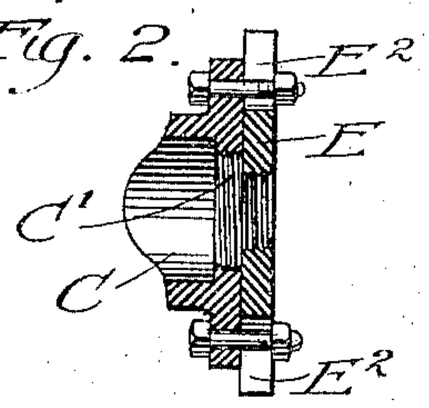


Fig. 11.

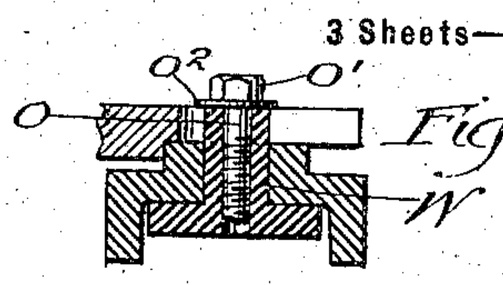


Fig. 14.

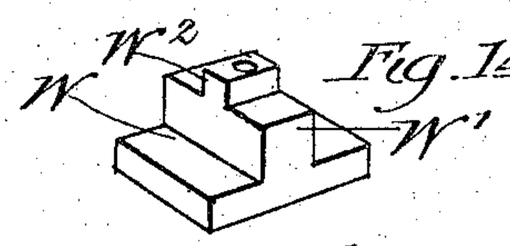


Fig. 1.

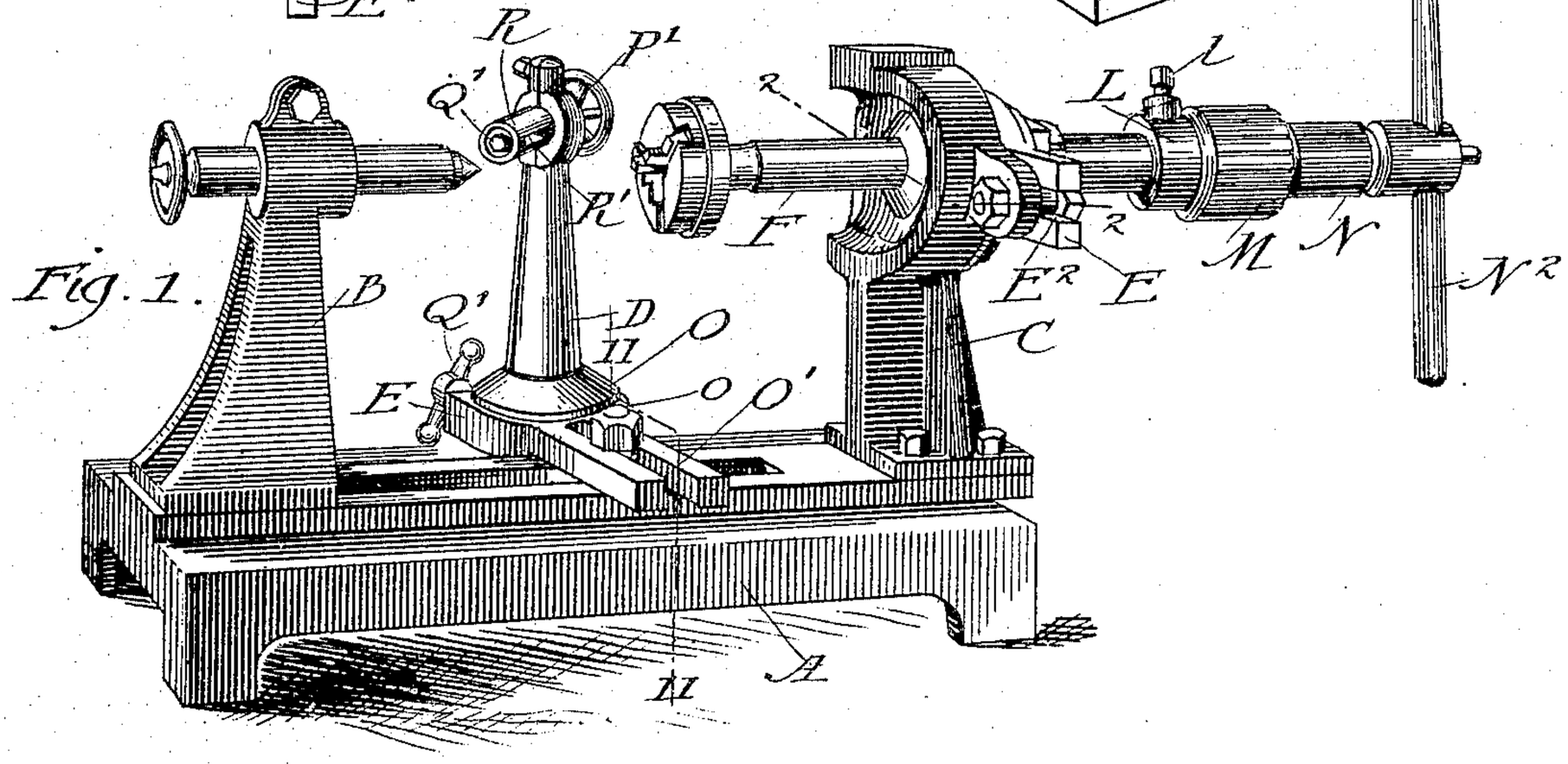
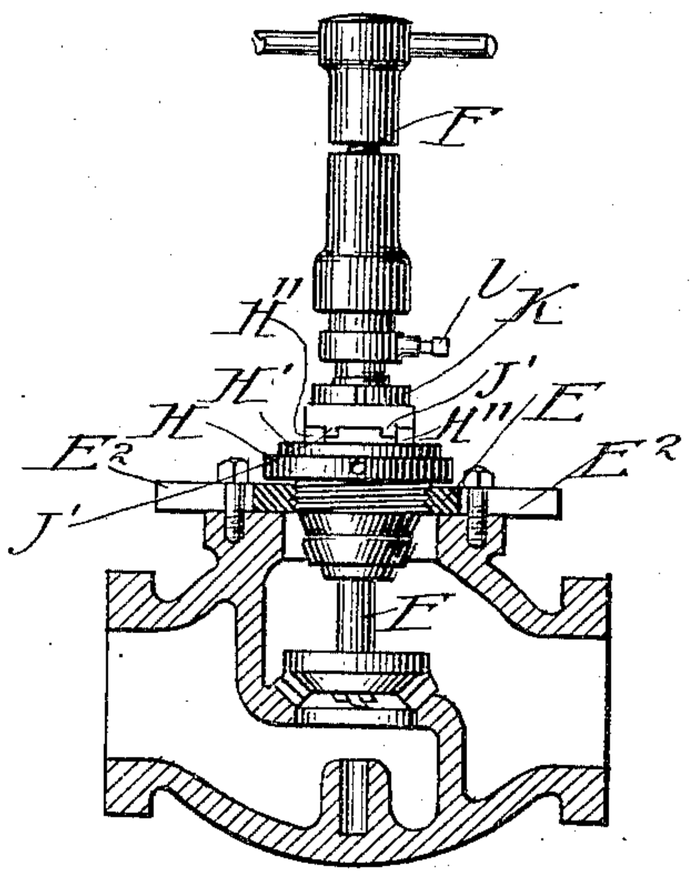


Fig. 12.



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(Application filed Nov. 28, 1900.)

(No Model.)

3 Sheets—Sheet 2.

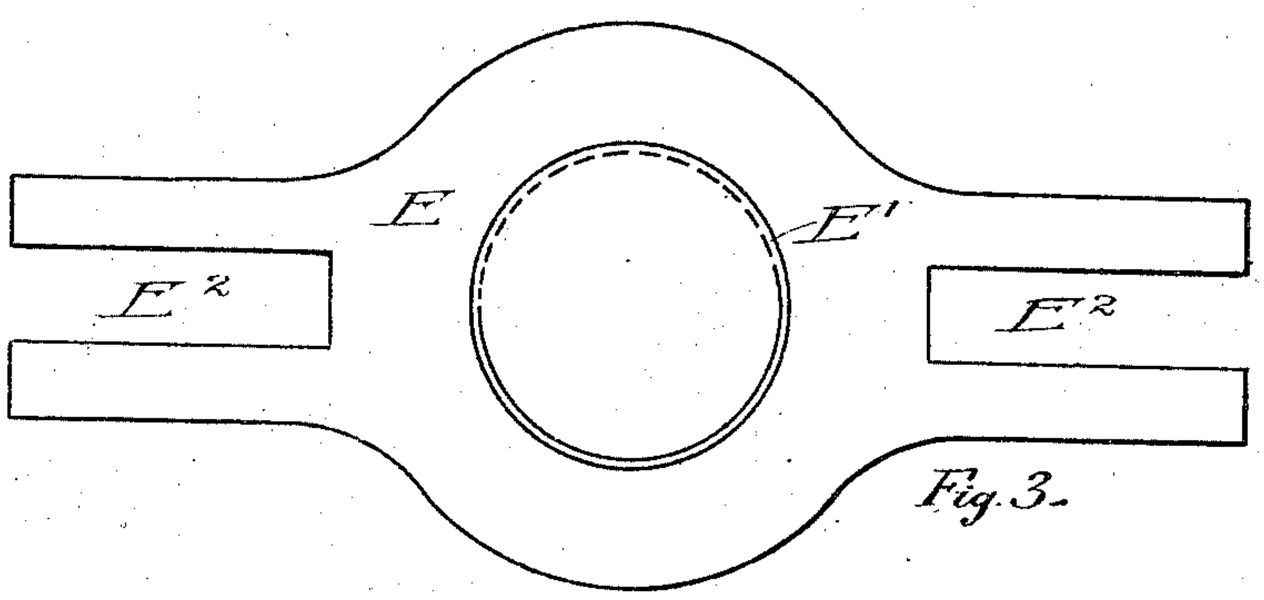

Fig. 3.

Fig. 4.

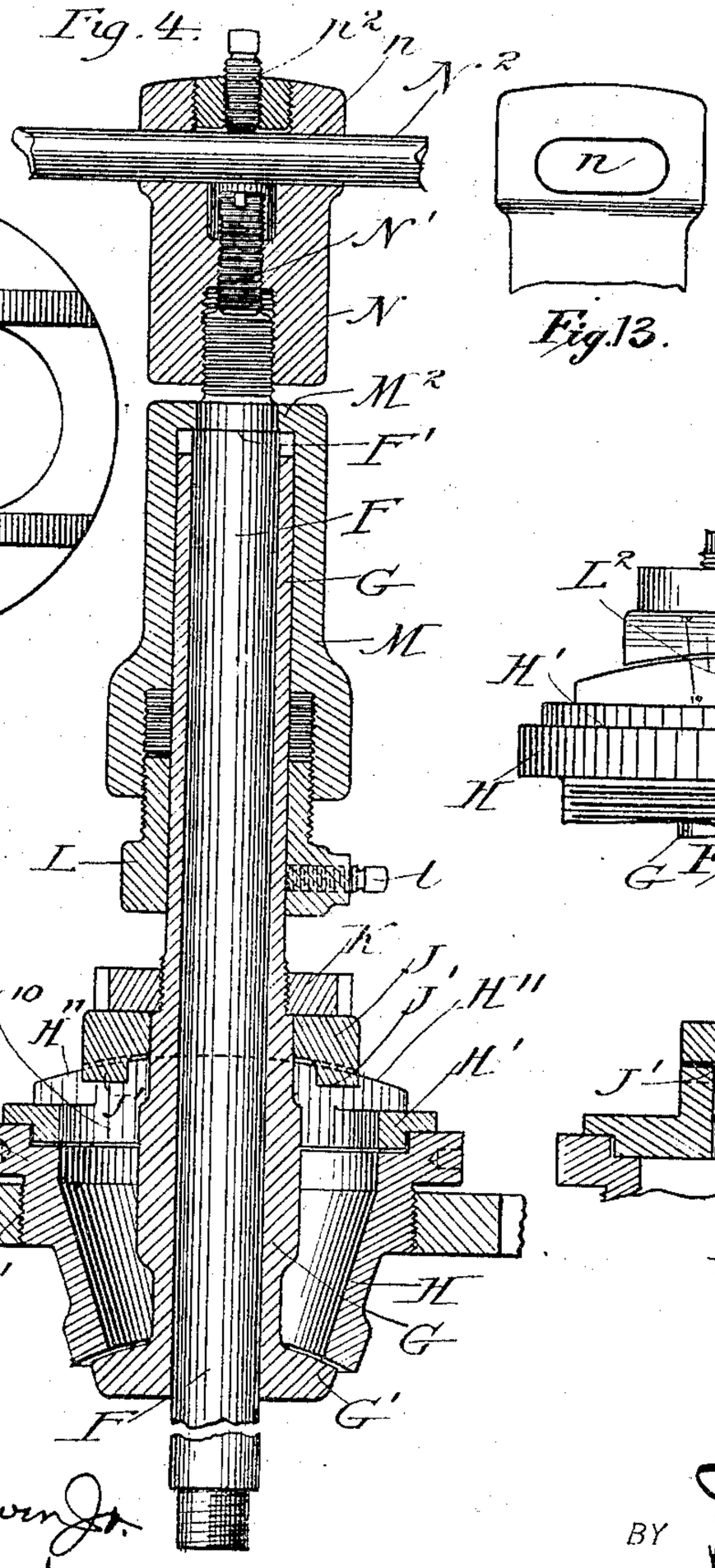

Fig. 7.

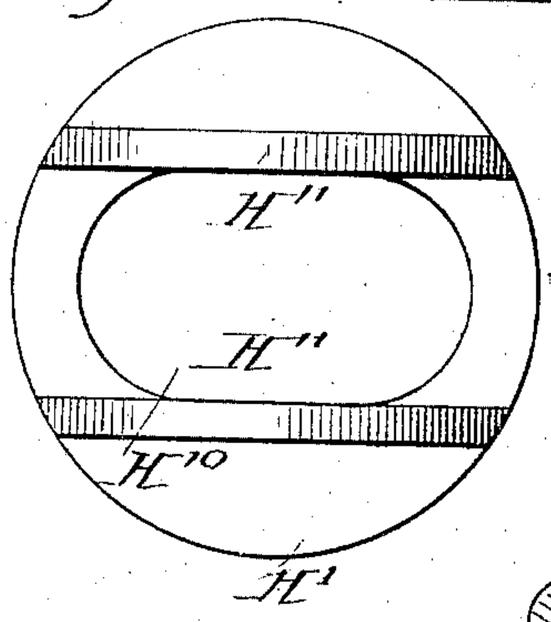

Fig. 13.

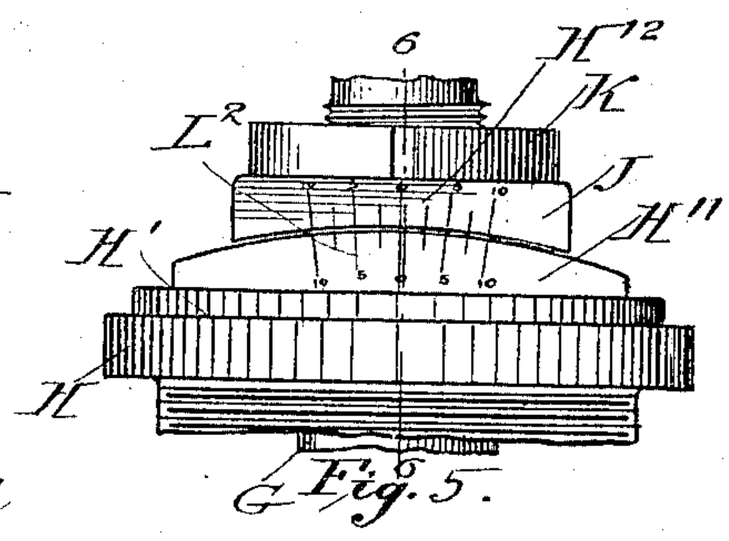

Fig. 5.

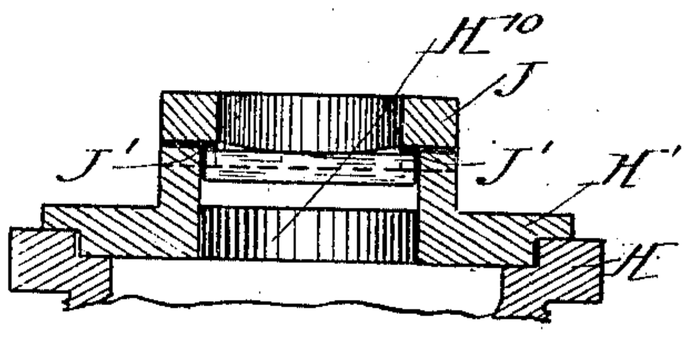

Fig. 6.

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No. 682,368. Patented Sept. 10, 1901.

F. L. SMITH.

COMBINED GATE AND GLOBE VALVE RESEATING MACHINE.

(Application filed Nov. 28, 1900.)

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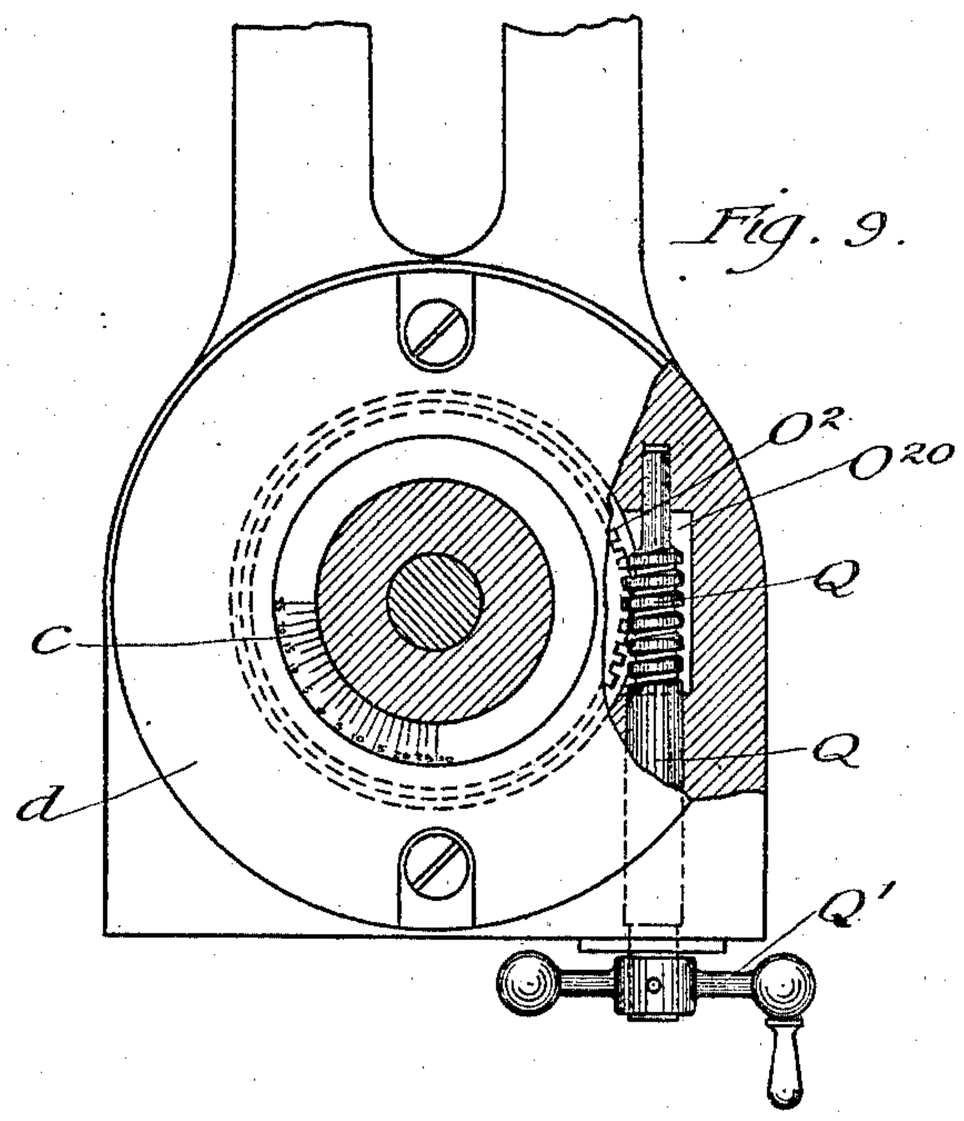

Fig. 9.

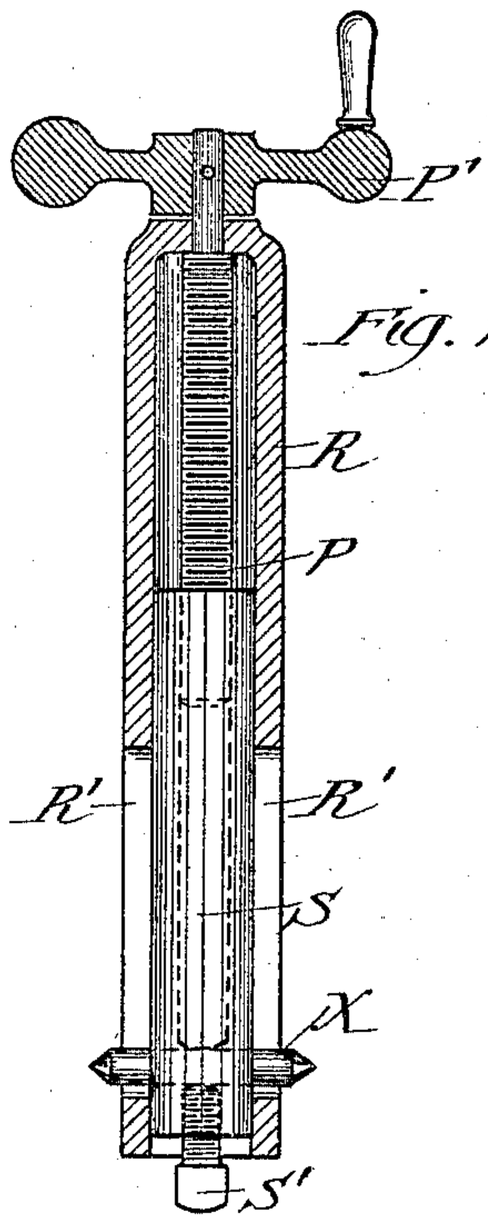

Fig. 10.

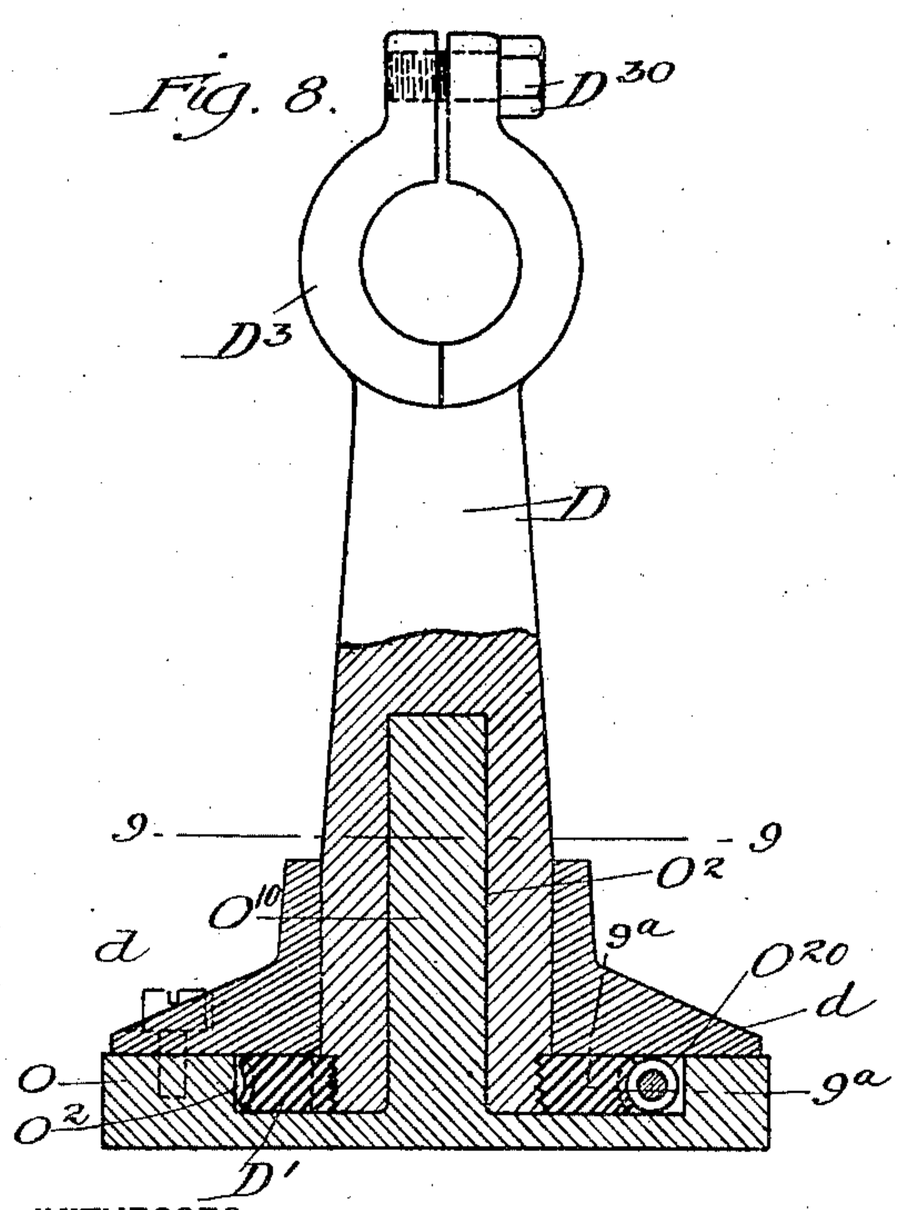

Fig. 8.

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his ATTORNEYS

UNITED STATES PATENT OFFICE.

FRANK L. SMITH, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO ALVA C. RICKSECKER, OF SAME PLACE.

COMBINED GATE AND GLOBE VALVE RESEATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 682,368, dated September 10, 1901.

Application filed November 28, 1900. Serial No. 37,954. (No model.)

To all whom it may concern:

Be it known that I, FRANK L. SMITH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in a Combined Gate and Globe Valve Reseating Machine, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved apparatus for reseating valves which shall be adapted for use with either gate or globe valves and also for truing up the seats of globe-valves on the pipe-line with which they are connected.

It consists of features of construction which are specified in the claims.

In the drawings, Figure 1 is a perspective view of my improved machine, showing the parts assembled as they would be for operation upon a valve. Fig. 2 is a detail horizontal axial section of the head or bracket pertaining to said machine which supports an adjustable shaft-bearing, the section being made in the plane denoted by the line 2 2 on Fig. 1. Fig. 3 is a plan of a bracket-plate for receiving the adjustable shaft-bearing, adapted to be mounted either upon the head, as shown in the assembled machine in Fig. 1, or on the valve-body in the pipe-line. Fig. 4 is an axial section of a tool or chuck holder, with an adjustable bearing and the plate which holds it. Fig. 5 is a detail side elevation of a portion of the angularly-adjustable shaft-bearing. Fig. 6 is a detail section at the line 6 6 on Fig. 5. Fig. 7 is a plan of the rotatable element of the sleeve which constitutes part of the adjustable shaft-bearing. Fig. 8 is an elevation of a swiveled tool-standard, partly shown in vertical section through the swivel-axis. Fig. 9 is a section at the line 9 9 on Fig. 8, broken away in part and shown in horizontal section at the line 9^a 9^a on said Fig. 8. Fig 10 is an axial section of the tool-holder to be held in the upper part of the standard shown in Fig. 8. Fig. 11 is a detail vertical section at the plane denoted by the line 11 11 on Fig. 1. Fig. 12 is a view in axial section of a globe-valve having my improved device for dressing the seat shown in elevation mounted thereon in position for work in the seat. Fig. 13 is a detail side elevation of the crank-hub. Fig. 14 is a perspective of a nut or clamping block W for securing the tool-holder to the bed.

My improved machine when all its parts are assembled, as shown in Fig. 1, for the purpose of certain sorts of work for which it is adapted comprises a base-frame A, upon which there is mounted a supporting-head B for a dead-center and a head or bracket C for supporting a live-center or rotatable shaft; also on this base-frame there is supported a swivel-mounted standard D for holding a transversely-operating chuck or tool. The rotatable shaft mounted on the bracket C is provided with an adjustable bearing and with its said bearing is designed to be used either as shown in Fig. 1, mounted in the bracket on the base-frame A, or mounted directly in the valve-body on the pipe-line, for the purpose of truing up the valve-seat in such body. I will first describe the construction of this part of my invention.

Referring to Fig. 4, E represents a bracket-plate, also seen in Figs. 1 and 2, having a central threaded aperture E′, and in diametric line therewith slots E^2 E^2, by which it is adapted to be mounted either upon the back of the bracket C, as shown in Figs. 1 and 2, or directly upon a valve-body in the pipe-line, as shown in Fig. 12. H H′ represent a two-part collar, of which the outer part is provided with an exterior thread and is adapted to be screwed into the aperture E′ of the plate E. This collar has its aperture widely enlarged at the outer end and tapering toward the inner end, and at the outer end there is seated in it in a manner to be rotated about its axis the other part H′ of said collar. Said part H′ of the collar has an oblong aperture H^{10}, and on its outer face is channeled in the direction of the greatest dimension of the oblong aperture, such channel being bounded by the ribs or shoulders H^{11} H^{11}, whose faces are cylindrically curved about an axis parallel with the plane of rotation of the part H′ and to a line therein transverse to the longer dimension of the oblong aperture. The radius of such curvature is such that when the two parts of the collar are assem-

bled, as in Fig. 4, the axis of curvature intersects the axis of the collar at some distance inward from the inner end of the latter, and said inner end of the collar is spherically curved about the point of intersection of said axis of cylindrical curvature with the axis of the collar. G is a sleeve which extends through the collar and constitutes a bearing for the rotatable shaft F, which extends through the sleeve, protruding therefrom at both ends. The sleeve has at its inner end an enlargement or boss G′, which is stopped against the inner spherically-curved end of the collar and is correspondingly spherically curved on its face, abutting against said end of the collar. J is a collar lodged and adapted to move longitudinally on the bearing-sleeve G at the outer end of the two-part collar H H′ and designed to constitute a stop for said sleeve opposite to the stop afforded by the boss G′, so that the sleeve may be held between said two stops. K is a nut which is screwed onto the sleeve outside the stop-collar J, the sleeve being threaded suitably for that purpose. This nut serves to force and bind the stop-collar J against the outer rotatable element H′ of the two-part collar and so bind the two parts together rigidly and also at the same time bind them rigidly to the bearing-sleeve. From this construction it will be understood that the bearing-sleeve and shaft therein may be oscillated in an arc about the axis of the cylindrical curve of the exterior face of the ribs of the part H′, and that by rotating said part H′ with respect to the part H of the two-part sleeve such oscillation may take any path radial to the axis of the sleeve, so that there is thus provided perfect adjustability for the bearing-sleeve and shaft within the range of a certain limited segment of a sphere whose center is the center of spherical curvature of the inner end of the sleeve, thus permitting the angular variation of the direction of the rotatable shaft within such range. For a more accurate control and guidance of the bearing-sleeve in such adjustment the stop-collar J has projections J′ J′ taking down into the channel between the cylindrically-curved ribs H^{11}, as seen in Figs. 4 and 6, so that when the rotatable part H′ of the collar has been set at any given position with respect to the fixed part the shaft may be oscillated accurately in the plane thus determined about the axis of the cylindrical curve without incurring risk of deflection from that plane while such angular adjustment is being made. For the purpose of advancing and retracting the shaft F longitudinally through the bearing-sleeve the sleeve has an exteriorly-threaded element L, adapted to be made rigid with it, and a feeding-sleeve M, mounted on the bearing-sleeve G, is enlarged and interiorly-threaded at one end to engage the thread of the element L, said feeding-sleeve M having at the outer end a stop-flange M^2, which communicates with a stop-shoulder F′ on the shaft F to force the shaft longitudinally forward when the feeding-sleeve M is rotated in one direction and permit it to be retracted when the sleeve is rotated in the opposite direction. A part N, which constitutes a hub for a crank N^2, by which the shaft F may be rotated, serves also as a stop against which the feeding-sleeve M operates in the reverse direction to retract the shaft F. In order that a quick adjustment of the shaft F may be made longitudinally when desired, the element L is made in the form of a collar which slides on the sleeve G and is provided with a set-screw *l* to secure it at any desired position, so that by loosening the set-screw the collar L and feed-sleeve M may be caused to slide together on the bearing-sleeve G to make an approximate adjustment of the shaft longitudinally, the set-screw *l* being then fastened. Final or accurate adjustment and the continuous advance feed movement which may be required by the work may be made by the operator rotating the seat-sleeve M as the work progresses or as such adjustment has to be made. The crank-hub N is attached to the shaft F by being screwed thereonto, and said threaded connection is made secure by means of a stop and adjusting-screw N′, which is set in axially through the hub from the outer end and may be reached by withdrawing the crank, which is inserted through a transverse aperture *n* in the hub N and retained by a set-screw n^2, which is also removed in order to get access to the head of the stop and adjusting-screw N′. In using this device to dress the seat of a valve in a pipe-line, the cap of the valve-body being removed, the bracket-plate E is lodged upon the valve-body in the position occupied by the cap and with its slots E^2 E^2, if possible, in position to be secured by two of the screws which secure the cap to the body, or, if none of the screws are precisely in the position required for that purpose, in such position that a clamping-block which may be held by such screws may be lodged at each end across the slots E^2, respectively, and may be made to bind the bracket-plate rigid with the valve-body by tightening the screws which have held the cap. However, before thus securing the bracket-plate the nut K will be loosened, so as to leave the bearing-sleeve G free to take any angular position in the two-part collar which may be necessary, and the set-screw *l* being loosened the shaft F is left free to take any position longitudinally in the sleeve which may be necessary. With all the parts thus loose and free the tool which may be mounted upon the inner end of the shaft F and which will have been selected to correspond as nearly as may be with the face of the valve-seat as to its taper, if it is tapered, or to a flat face, when that is the form, can be brought into a position with respect to the valve-seat at which it may operate thereon to true it up with the least cutting away of the seat—that is, it may be centered with respect to the axis of the valve-seat and in-

clined, if necessary, in any direction to accommodate it to any inclination of the axis of the seat with respect to the plane of the outer face of the valve-body upon which the bracket-plate E is secured. When the parts are thus brought into proper relation, the bracket-plate will be bound tightly onto the valve-body and the stop-nut K will be tightened against the stop-collar J, thus binding the two parts of the sleeve H H′ together and binding them both rigid with the driving-sleeve G. The set-screw *l* being now tightened, the crank may be rotated to operate the tool and dress the valve as desired, the tool being advanced to its work, as may be necssary, by rotating the sleeve M. If for any purpose it is necessary or desirable to maintain the axis of the shaft F at right angles to the plane of the outer face of the valve-body to which the bracket-plate E is secured or to maintain it at any other angle thereto, proper adjustment may be made by means of a graduated scale (shown at H^{12} and L^2) on the side of one of the ribs H^{11} and on the side of the stop-collar J, as shown in Fig. 5. It will be understood that it is not necessary to make the graduated scale upon both parts, a mere reading-point or index-point on one of them being sufficient if the scale is on the other; but the scale may be made upon both parts, as shown, any one of the scale-marks, as the zero-point, for example, on one scale serving as the reading or index point, against which the reading on the other scale may be noticed.

The entire device shown in Fig. 4 may be employed in the machine shown in Fig. 1, either a chuck or a cutter-head for operating upon the work being secured to the inner end of the shaft F. In such use the bracket-plate E may be secured to the bracket C in the same manner as it would be secured to the body of the valve in the use already described, or in case of a tool of a larger size being used the bracket-plate E may be dispensed with and the fixed member H of the two-part collar may be screwed directly into the aperture C′ of the bracket C, said aperture being interiorly threaded, as shown, for that purpose. This mode of using the device (with or without the plate E) is most frequently resorted to for the purpose of dressing valves, which for that purpose may be withdrawn from the valve-body and held in a chuck secured to the end of the shaft F, the dressing-tool being in that case operated transversely with respect to the axis of the shaft F. For this purpose there is provided the swivel-mounted standard D, whose base-plate O extends across the base-frame A and is secured thereto in any suitable manner for securing a tool-head to a lathe, adapting it to be adjusted both longitudinally and transversely with respect to the bed—that is to say, a bolt *o*, taking through the slot O′ in the base-plate O, engages a cross-bar W, which extends across the side bars of the base-frame underneath the same and has an oblong rectangular boss W′ protruding up between said side bars, and protruding up from the bars W′ a rectangular boss W^2, entering the slot O′ and centrally apertured and threaded to receive the bolt, whose head *o*′, protected by a suitable washer o^2, is engaged above the base-plate O. The swivel-mounting of the standard D is effected by providing a vertical spindle O^{10}, extending up from the base-plate O, which is counterbored around such spindle, forming a socket O^2, the standard having an axial bore from the bottom upward to receive the spindle O′ and having at its lower end a worm-gear D′, made rigid therewith and constituting a flange thereon which is adapted to be received in the socket of the base-plate when the standard is fastened onto the spindle. A lateral recess O^{20}, extending from the socket O^2, accommodates a worm-shaft Q, which is suitably journaled in the base-plate, having its worm engaging the worm-gear flange of the standard D and provided outside the base-plate with an operating-handle Q′. An annular cap or retaining-plate *d*, centrally apertured to fit the lower portion of the standard D above the flange D′, is arranged to be secured to the base-plate O and constitute a cap to close the cavity in which the worm-shaft and worm-gear are lodged, and at the same time a retaining-plate under which the worm-gear flange being engaged retains the standard in place on the base-plate. At the upper end of the standard D there is a split bearing D^3 to receive the transversely-extended tool-holder sleeve R, which, being inserted through the aperture of the bearing D^3, is tightly secured therein by clamping the same together by means of the nut D^{30}. In the tool-holder sleeve R the tool-holder S is adapted to be accurately seated and longitudinally moved, the tool-holder being axially apertured and interiorly threaded to be engaged by the feed-screw P, whose stem or shaft extends out through the otherwise closed end of the tool R and receives an operating-handle P′. The tool X is inserted transversely through the tool-holder S near one end and is held rigidly in such position by means of the set-screw Q′, screwed into the end of the tool-holder and impinging against the tool, as seen in Fig. 10. The tool protrudes through the slots R′ R′ at opposite sides of the tool-holder sleeve R, said slots being of suitable length to allow for the maximum advance and retraction of the tool-holder and tool effected by rotating the feed-screw P. It will be understood that by means of the worm-shaft Q the swiveled standard may be rotated to adjust it about the swivel-axis to cause the axis of the tool-holder, which is mounted transversely in the upper end of the standard, to extend at any angle desired with respect to the length of the bed or base frame A or shaft F, and the tool may thus be caused to advance accurately across the face of a valve, either flat or tapering at any angle in either direction. In order that the tool may be set accurately at any desired angle,

the upper edge of the annular retaining-plate and cap *d* may be graduated, as shown at *c*, and an index-mark on the side of the standard so placed that it will register with zero of the graduated scale when the axis of the tool-holder is directly transverse to the length of the bed or base frame and to the axis of the two-part collar H H′, the graduated scale being extended in both directions from such zero-point, so that deviation from such direct transverse line in either direction may be accurately produced and noted. The adjustability of the bearing-sleeve G in horizontal plane may to an extent serve the same purpose as the adjustability of the standard D about its swivel-axis, and any desired angle which it may be desired to produce between these two may be made by partial adjustment of each, and by this means often great increase of convenience in doing the work is obtained. For special situations or for dressing valves of special forms it may be found desirable sometimes to utilize a vertical angular adjustment of the shaft F in connection with a horizontal angular or oblique adjustment of the tool-holder S.

It will be noticed that the form of connection described between the bearing-sleeve G and the two-part collar H H′ is such as to constitute between these parts a universal joint with a limited range. Such universal-joint connection I regard as an important feature of my invention, and I do not limit myself strictly to the specific mode herein shown of obtaining such universal joint. Any mechanic will readily devise other means for the same purpose. Nevertheless, the particular structure shown has specific advantages already pointed out and is for that reason claimed specifically.

I claim—

1. A valve-reseating machine, comprising a rotatable shaft adapted at one end to carry a tool and provided at the other end with means for rotating it; a bearing in which the shaft is journaled; a support for the bearing in which the latter is adjustable angularly; and corresponding stops on the support and bearing, curved about a center located beyond them in the direction of the tool-holding end of the shaft; and means for making the bearing rigid with its support.

2. A valve-reseating machine, comprising a rotatable shaft, a sleeve in which the shaft is journaled, a collar through which the sleeve extends loosely, affording range for change of axial direction of the shaft and sleeve relative to the collar; stops on the sleeve at opposite ends of the collar, and means for clamping the collar between the stops.

3. A valve-reseating machine, comprising a rotatable shaft, a sleeve in which the shaft is journaled, a collar through which the sleeve extends loosely, affording range for change of axial direction of the shaft and sleeve relative to the collar, the collar having its opposite ends concentrically curved; stops on the sleeve at opposite ends of the collar; and means for making the sleeve rigid with the collar.

4. A valve-reseating machine, comprising a rotatable shaft, a bearing-sleeve in which the shaft is journaled, a collar through which the sleeve extends loosely, affording range for change of axial direction of the shaft and sleeve relative to the collar, the collar having its opposite ends concentrically curved, and stops on the sleeve at opposite ends of the collar.

5. A valve-reseating machine, comprising a rotatable shaft, a sleeve in which the shaft is journaled, a collar through which the sleeve extends loosely, affording range for change of axial direction of the shaft and sleeve relative to the collar; said collar having its opposite ends curved about a common center located in the line of the axis; stops on the sleeve at opposite ends of the collar, and means for making the sleeve rigid with the collar.

6. A valve-reseating machine, comprising a rotatable shaft, a sleeve in which the shaft is journaled, a collar through which the sleeve extends loosely, affording range for change of axial direction of the shaft and sleeve relative to the collar, stops on the sleeve at opposite ends of the collar, one of said stops being movable on the sleeve toward and from the collar, and means for forcing and securing it against the collar, to clamp the latter between the stops.

7. A valve-reseating machine, comprising a rotatable shaft, a sleeve in which the shaft is journaled, a collar through which the sleeve extends loosely, affording range for change of axial direction of the shaft and sleeve relative to the collar, said collar having its opposite ends concentrically curved; stops on the sleeve at opposite ends of the collar, one of said stops being movable on the sleeve toward and from the collar; and means for forcing and securing it against the collar to clamp the latter against the stops.

8. A valve-reseating machine, comprising a rotatable shaft; a sleeve in which the shaft is journaled; a two-part collar through which the sleeve extends loosely, one part having an aperture enlarged in all directions from the axis, and the other having an oblong aperture and adapted to be rotated about the axis with respect to the first part; and means for making the two parts of the collar rigid with each other and with the sleeve.

9. A valve-reseating machine, comprising a rotatable shaft, a sleeve in which the shaft is journaled, a two-part collar through which the sleeve extends loosely, one part having an aperture enlarged in all directions about the axis, and the other having an oblong aperture and adapted to be rotated about the axis with respect to the first part; stops on the sleeve at opposite ends of the collar, one of said stops being movable on the sleeve toward and from the collar; and a nut screwed

on the sleeve outside the movable stop, to force and secure it against the collar between the stops.

10. A valve-reseating machine, comprising a rotatable shaft; a sleeve in which the shaft is journaled; a collar through which the sleeve extends loosely, affording range for change of axial direction of the collar and sleeve relative to the collar; said collar having its opposite ends concentrically curved; stops on the sleeve at opposite ends of the collar, one of said stops being movable on the sleeve toward and from the collar; and a nut screwed on the sleeve outside the movable stop to force and secure it against the collar to clamp the latter between the stops.

11. A valve-reseating machine, comprising a rotatable shaft; a sleeve in which the shaft is journaled; a two-part collar through which the sleeve extends loosely, one part having an aperture enlarged in all directions about the axis, and the other having an oblong aperture and adapted to be rotated about the axis with respect to the first part; stops on the collar at opposite ends of said two parts of the latter, one of said stops being movable on the sleeve toward and from the collar; and means for forcing and securing it against the collar to clamp the latter between the stops.

12. A valve-reseating machine, comprising a rotatable shaft; a sleeve in which the shaft is journaled; a two-part collar through which the shaft extends loosely, one part having an aperture enlarged in all directions about the axis, and the other having an oblong aperture and adapted to be rotated about the axis with respect to the first part; said rotatable part being curved cylindrically about an axis parallel to the plane of its rotation and to a line therein at right angles to the longer dimension of the oblong aperture; stops on the sleeve at opposite ends of the two-part collar, the stop at the end of the cylindrically-curved rotatable part being correspondingly curved; and a nut on the sleeve for clamping said stop against the cylindrically-curved member of the sleeve.

13. A valve-reseating machine, comprising a rotatable shaft; a sleeve in which such shaft is journaled; a two-part collar through which the sleeve extends loosely, one part having an aperture enlarged in all directions about the axis, and the other having an oblong aperture and adapted to be rotated about the axis with respect to the first part, and being at the outer side—which constitutes the end of the sleeve—curved cylindrically and channeled in the direction of the longer dimension of its oblong aperture; stops on the sleeve at opposite ends of the two-part collar, the stop at the cylindrically-curved end of the rotatable part being correspondingly curved and adapted to be engaged in the channel, whereby it is rotated with the rotatable member, and seats on the cylindrically-curved face of the latter at all angular adjustments of the same.

14. A valve-reseating machine, comprising a rotatable shaft; a sleeve in which such shaft is journaled; a two-part collar through which the sleeve extends loosely, one part having an aperture enlarged in all directions about the axis, and the other having an oblong aperture and adapted to be rotated about the axis with respect to the first part, and being at the outer side—which constitutes the end of the sleeve—curved cylindrically in the direction of the longer dimension of the oblong aperture; stops on the sleeve at opposite ends of the collar, the stop on the end of such cylindrically-curved part being correspondingly curved, and a nut on the sleeve for clamping said stop against the collar.

15. A valve-reseating machine, comprising a rotatable shaft; a bearing-sleeve in which said shaft is journaled; said bearing-sleeve having rigid with it an exterior-threaded element; a threaded feeding-sleeve journaled on the bearing-seat outside the latter and engaging the thread of the threaded element of the bearing-sleeve, rotatable with respect thereto, and having a stop-shoulder; the shaft having a corresponding shoulder stopped against that of the feeding-sleeve; means for holding the bearing-sleeve rigid; and means for rotating the shaft.

16. A valve-reseating machine, comprising a rotatable shaft; a bearing-sleeve in which the shaft is journaled, said bearing having rigid with it an exterior element exteriorly threaded; a threaded feeding-sleeve journaled on the bearing-sleeve, outside the latter, screwed about said threaded element of the bearing-sleeve, rotatable with respect thereto, and having a stop-shoulder; the shaft having a corresponding shoulder stopped against that of the feeding-sleeve; means for holding the bearing-sleeve rigid; and means for rotating the shaft.

17. A valve-reseating machine, comprising a rotatable shaft; a bearing in which the shaft is journaled; a sliding collar on the bearing, and means for making it rigid with the latter, said collar being threaded; a threaded feeding-sleeve journaled on the bearing-sleeve outside the same screwed to said collar, rotatable with respect thereto, and having a stop-shoulder; the shaft having a corresponding shoulder, stopped against that of the feeding-sleeve; means for holding the bearing-sleeve rigid; and means for rotating the shaft.

18. A valve-reseating machine, comprising a rotatable shaft; a bearing-sleeve in which the shaft is journaled; a collar through which the sleeve extends loosely, said collar being at one end exteriorly curved and widely apertured to permit change of the axial direction of the sleeve with respect to the collar; stops on the sleeve at opposite ends of the collar, the stop at the curved end of the collar being correspondingly curved to seat on such curved end; one of the stops being movable with respect to the shaft, and means

for forcing and holding it toward the other stop to bind the collar between the stops.

19. A valve-reseating machine, comprising a rotatable shaft; a bearing-sleeve in which the shaft is journaled; a collar through which the sleeve extends loosely; stops on the sleeve at opposite ends of the collar; said collar being at one end exteriorly threaded and widely apertured to permit change of the axial direction of the sleeve in respect to the collar, the sleeve at that end being correspondingly curved to seat on the curved end of the collar; said collar and stop being graduated in the arc of such curvature to indicate the angular displacement of the sleeve from any assumed initial position.

20. A valve-reseating machine, comprising a rotatable shaft; a bearing in which the shaft is journaled; a collar through which the sleeve extends loosely; stops on the opposite ends of the collar, the collar being at one end exteriorly threaded and widely apertured to permit change of the axial direction of the sleeve in respect to the collar, the stop at that end being correspondingly curved to seat on the curved end of the collar; said collar and stop being graduated in the arc of such curvature to indicate the angular displacement of the sleeve from any assumed initial position; one of the stops being movable on the sleeve toward and from the collar, and means for forcing and securing it against the collar to clamp the latter between the stops.

21. A valve-reseating machine, comprising a rotatable shaft; a bearing-sleeve in which the shaft is journaled; a two-part collar through which the sleeve extends loosely; stops on the sleeve at opposite ends of the collar; one part of the collar being seated on and rotatable with respect to the other, said other part being, at the end at which the first part is seated, widely apertured in all directions about the axis, the first part having its outer end curved about an axis parallel to the plane of rotation, and having an oblong aperture whose greater dimension is in a plane at right angles to the axis of such curvature; the stop at that end being correspondingly curved to seat on the curved end of the collar; said collar and stop being graduated in the arc of such curvature to indicate the angular displacement of the sleeve from any assumed initial position.

22. A valve-reseating machine, comprising a rotatable shaft; a bearing-sleeve in which the shaft is journaled; a two-part collar, through which the sleeve extends loosely; stops on the sleeve at opposite ends of the collar, one part of the collar being seated on and rotatable with respect to the other, said other part being, at the end at which such part is seated, widely apertured in all directions about the axis; the first part having its outer end curved about an axis parallel to the plane of rotation, and having an oblong aperture whose greater dimension is in a plane at right angles to the axis of such curvature, the stop at that end being correspondingly curved to seat on the curved end of the collar, and seated also on the sleeve; the collar and said stop having coöperating features for guiding the stop and thereby the bearing-sleeve on which it is seated, in the direction of the longer dimension of the oblong aperture.

23. A valve-reseating machine, comprising a rotatable shaft; a bearing-sleeve in which the shaft is journaled; a two-part collar through which the sleeve extends; stops on the sleeve at opposite ends of the collar, one part of the collar being seated on and rotatable with respect to the other, said other part being, at the end at which the first part is seated, widely apertured in all directions about the axis; the first part having its outer end curved about an axis parallel to the plane of its rotation, and having an oblong aperture whose greater dimension is in a plane at right angles to the axis of such curvature; means for guiding the sleeve laterally in such oblong aperture, and means for clamping the sleeve between the stops.

24. A valve-reseating machine, comprising a rotatable shaft; a bearing-sleeve in which the shaft is journaled; a collar through which the sleeve extends loosely, the collar being at one end exteriorly curved and widely apertured to permit change of the axial direction of the sleeve in respect to the collar, the stop at that end being correspondingly curved to seat on the curved end of the collar, and being seated also on the sleeve; the collar and said slot having coöperating features for guiding the stop and thereby the bearing-sleeve on which it is seated in the direction of the longer dimension of the oblong aperture.

25. A valve-reseating machine, comprising a rotatable shaft; a bearing-sleeve in which the shaft is journaled; a collar through which the sleeve extends loosely, the collar being at one end exteriorly curved and widely apertured to permit change of the axial direction of the sleeve in respect to the collar, the stop at that end being correspondingly curved to seat on the curved end of the collar, and being seated also on the sleeve; the collar and said sleeve having coöperating features for guiding the stop and thereby the bearing-sleeve on which it is seated in the direction of the longer dimension of the oblong aperture; and being graduated in the arc of such curvature to indicate the angular displacement of the sleeve from any assumed initial position.

26. A valve-reseating machine, comprising a rotatable shaft; a bracket-plate adapted to be rigidly mounted; having a circular threaded aperture; a universal joint, comprising an outer and an inner element, of which the latter constitutes a bearing for the shaft and penetrates the former and the former is an exteriorly-threaded collar adapted to be screwed to the bracket-plate and made rigid therewith; means for making said two parts

of the universal joint rigid with each other; and means for rotating the shaft.

27. A valve-reseating machine, comprising a base-frame; an apertured bracket mounted thereon; a rotatable shaft; a universal joint, comprising an inner and an outer element of which the former constitutes the bearing of the shaft and penetrates the latter and the latter penetrates the bracket and is adapted to be made rigid therewith; means for rotating the shaft; a standard swivel-mounted on the base-frame; means for rotating it about its swivel-axis; a sleeve adjustably secured in the standard transverse to the swivel-axis; a spindle longitudinally guided in the sleeve; and means for advancing and retracting it.

28. A valve-reseating machine, comprising a base-frame; an apertured bracket therein; a collar penetrating the bracket and adapted to be made rigid therewith; a bearing-sleeve extended through the collar, the latter being apertured to afford the sleeve a range for change of axial direction; means for making the bearing-sleeve rigid with the collar; a rotatable shaft journaled in the bearing-sleeve; means for rotating the shaft in the sleeve; a standard swivel-mounted on the base-frame; means for rotating it about its swivel-axis; a sleeve adjustably secured in the standard transverse to the swivel-axis; a spindle longitudinally guided in the sleeve; and means for advancing and retracting it.

29. A valve-reseating machine, comprising a base-frame; an apertured bracket mounted thereon; a collar penetrating the bracket and adapted to be made rigid therewith; the bearing-sleeve extending through the collar, the latter being apertured to afford the sleeve a range for change of axial direction, and means for making the bearing-sleeve rigid with the collar; a rotatable shaft journaled in the bearing-sleeve; means for rotating the shaft in the sleeve, a standard swivel-mounted and also adapted to be horizontally adjusted on the base-frame; means for rotating it about its swivel-axis; a sleeve adjustably secured in the standard transverse to the swivel-axis; a spindle longitudinally guided in the sleeve, and means for advancing or retracting it.

30. A valve-reseating machine, comprising a base-frame; an apertured bracket mounted thereon; a collar penetrating the bracket and adapted to be made rigid therewith; a bearing-sleeve extending through the collar, the latter being apertured to afford the sleeve a range for change of axial direction; and means for making the bearing-sleeve rigid with the collar; a rotatable shaft journaled in the bearing-sleeve, and means for rotating it in the sleeve; a standard, comprising a base-plate and an upright vertically journaled in the plate and provided with a horizontal worm-gear; a worm-shaft, journaled in the base-plate and engaging the gear to rotate the upright about the swivel-axis; a sleeve adjustably secured in the upright transverse to the swivel-axis; a spindle longitudinally guided in the sleeve; and means for advancing and retracing it.

31. A valve-reseating machine, comprising a base-frame; an apertured bracket mounted thereon; a collar penetrating the bracket and adapted to be made rigid therewith; the bearing-sleeve extending through the collar, the latter being apertured to afford the sleeve a range for change of axial direction, and means for making the bearing-sleeve rigid with the collar; a rotatable shaft journaled in the bearing-sleeve; and means for rotating the shaft in the sleeve; a standard, comprising a base-plate having an upstanding spindle, and a socket about the base of the spindle; an upright having an axial aperture to receive the spindle and a flange constituting a worm-gear lodged in the socket; a worm-shaft journaled in the base and engaging the worm-gear flange; an annular cap which is secured on the base and covers the socket inclosing the worm-shaft and worm-gear flange and at whose central aperture a vertical journal-bearing is afforded for the standard; a sleeve adjustably secured in the standard, transverse to the swivel-axis; a spindle longitudinally guided in the sleeve; and means for advancing and retracting it.

32. A valve-reseating machine, comprising a base-frame; an apertured bracket mounted thereon; a rotatable shaft; a universal joint, comprising an inner and an outer element, of which the former constitutes the bearing of the shaft and penetrates the latter and the latter penetrates the bracket and is adapted to be made rigid therewith; a standard swivel-mounted and also adapted to be adjusted horizontally on the base-frame; means for rotating it about the swivel-axis; a sleeve adjustably secured in the standard transverse to the swivel-axis; a spindle longitudinally guided in the sleeve, and means for advancing and retracting it.

In testimony whereof I have hereunto set my hand, at Chicago, Illinois, in the presence of two witnesses, this 19th day of November, A. D. 1900.

FRANK L. SMITH.

In presence of—
CHAS. S. BURTON,
ADNA H. BOWEN, Jr.