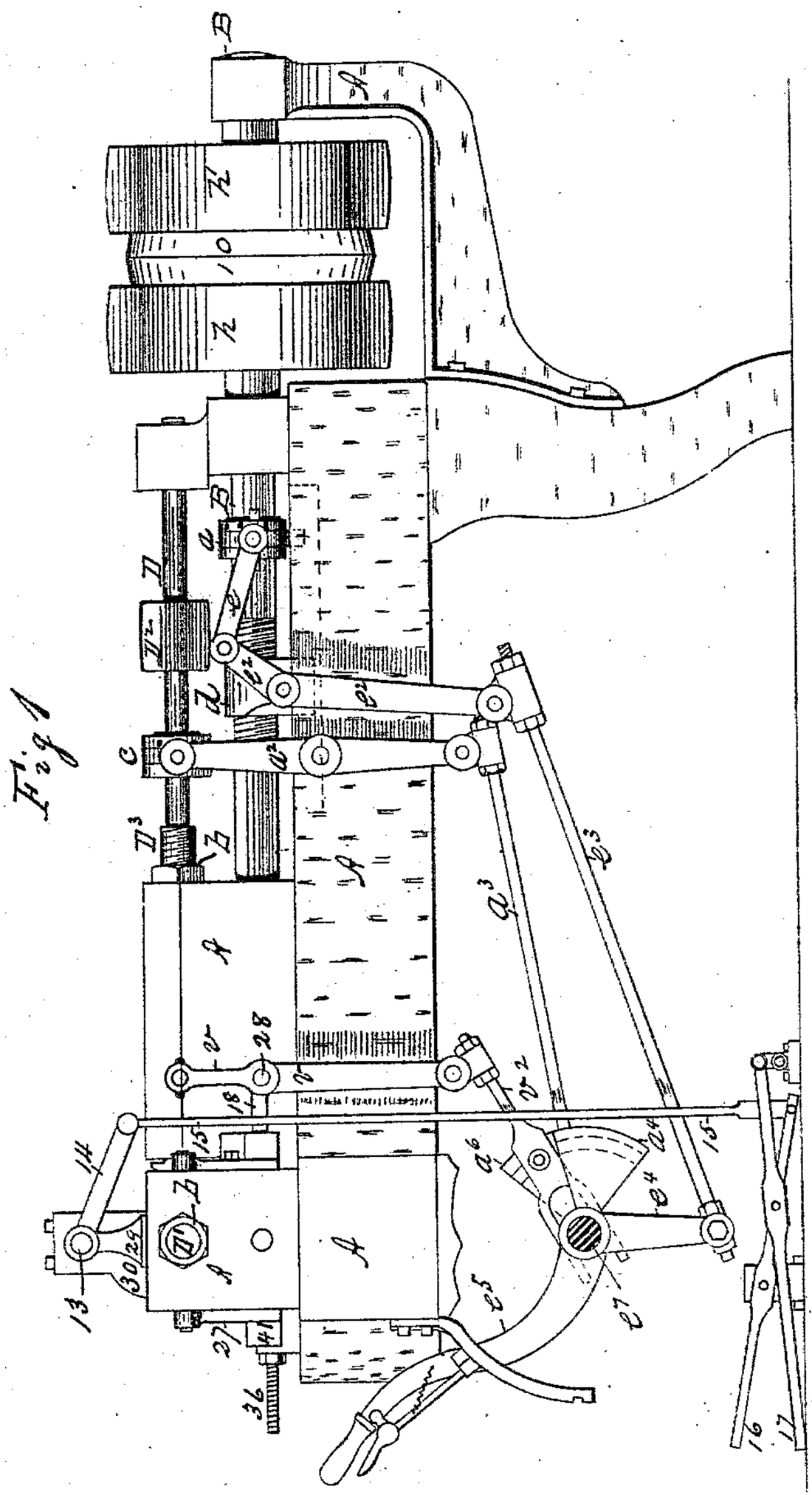
(No Model.) 4 Sheets—Sheet 1.

F. H. RICHARDS.

MACHINE FOR FINISHING GLOBE VALVE BODIES.

No. 281,138. Patented July 10, 1883.



WITNESSES

Henry Knox.

Wm. H. Chapin

INVENTOR

Francis H. Richards

By Henry A. Chapin

ATTORNEY

(No Model.) 4 Sheets—Sheet 2.

F. H. RICHARDS.

MACHINE FOR FINISHING GLOBE VALVE BODIES.

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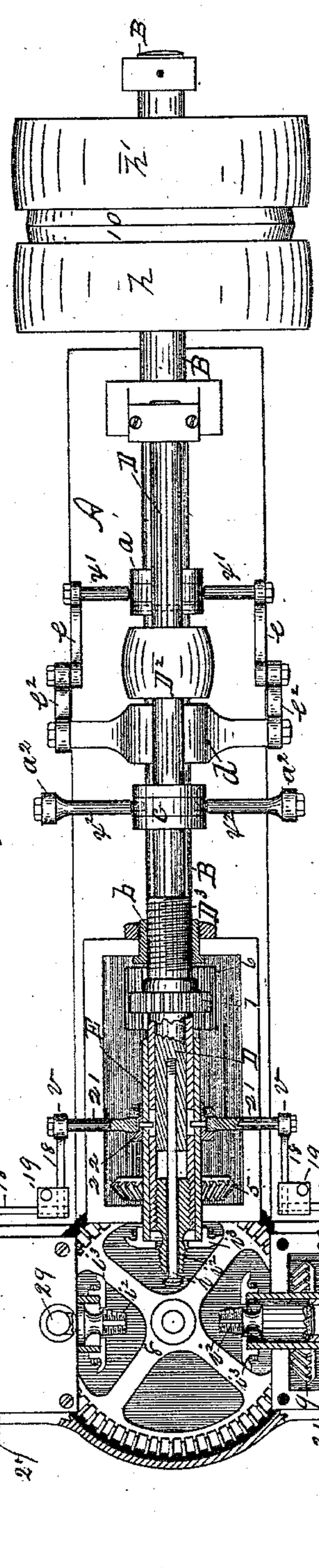

Fig. 2.

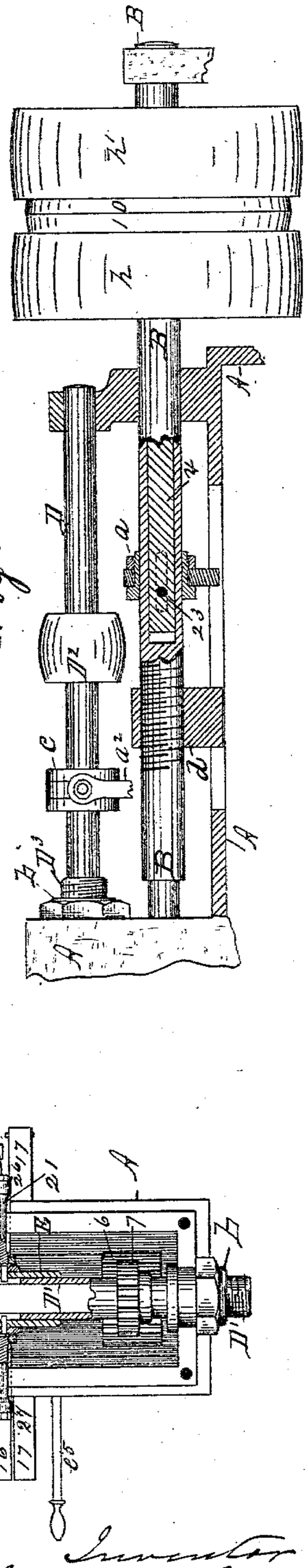

Fig. 3.

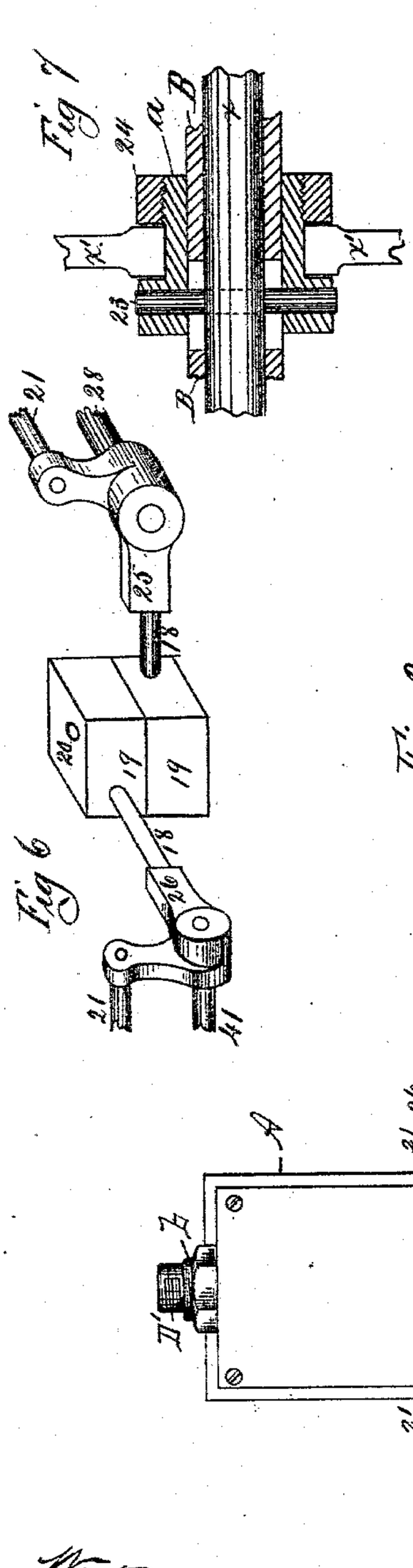

Fig. 6.

Fig. 7.

Witnesses
Henry Knox.
Wm. H. Chapin

Inventor
Francis H. Richards
By Henry A. Chapin
Atty

(No Model.) 4 Sheets—Sheet 3.

F. H. RICHARDS.

MACHINE FOR FINISHING GLOBE VALVE BODIES.

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Fig 4

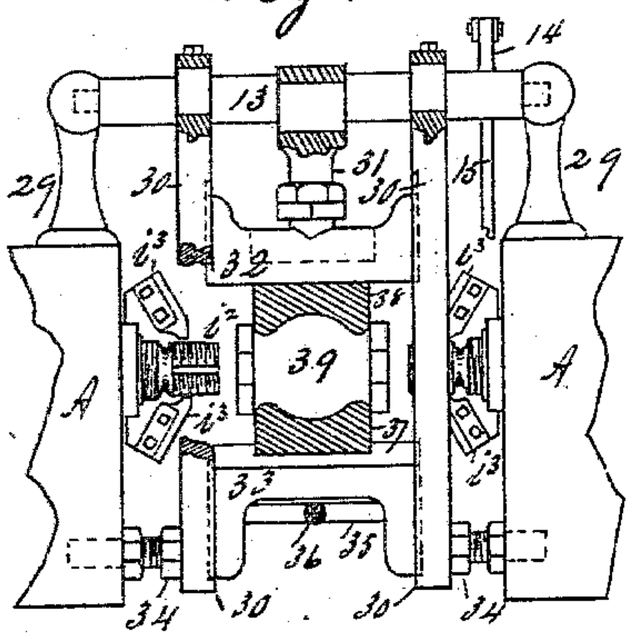


Fig 5

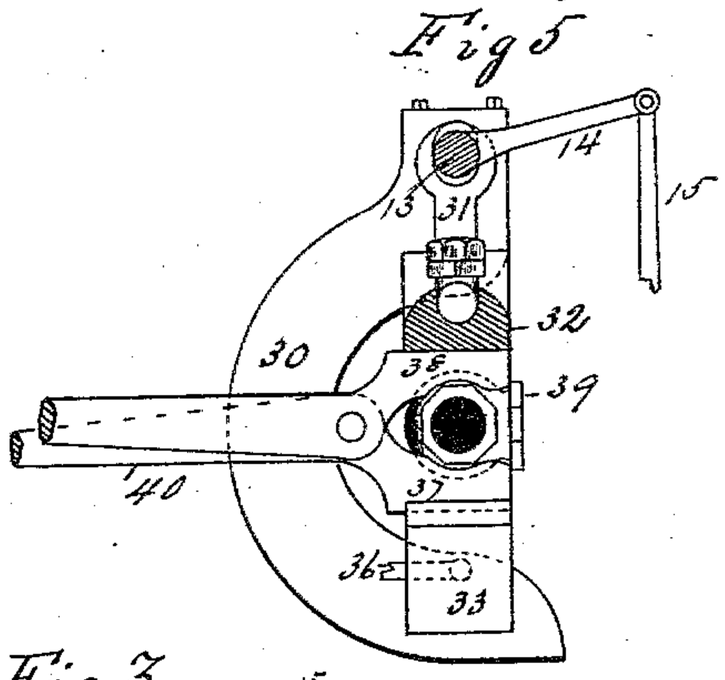
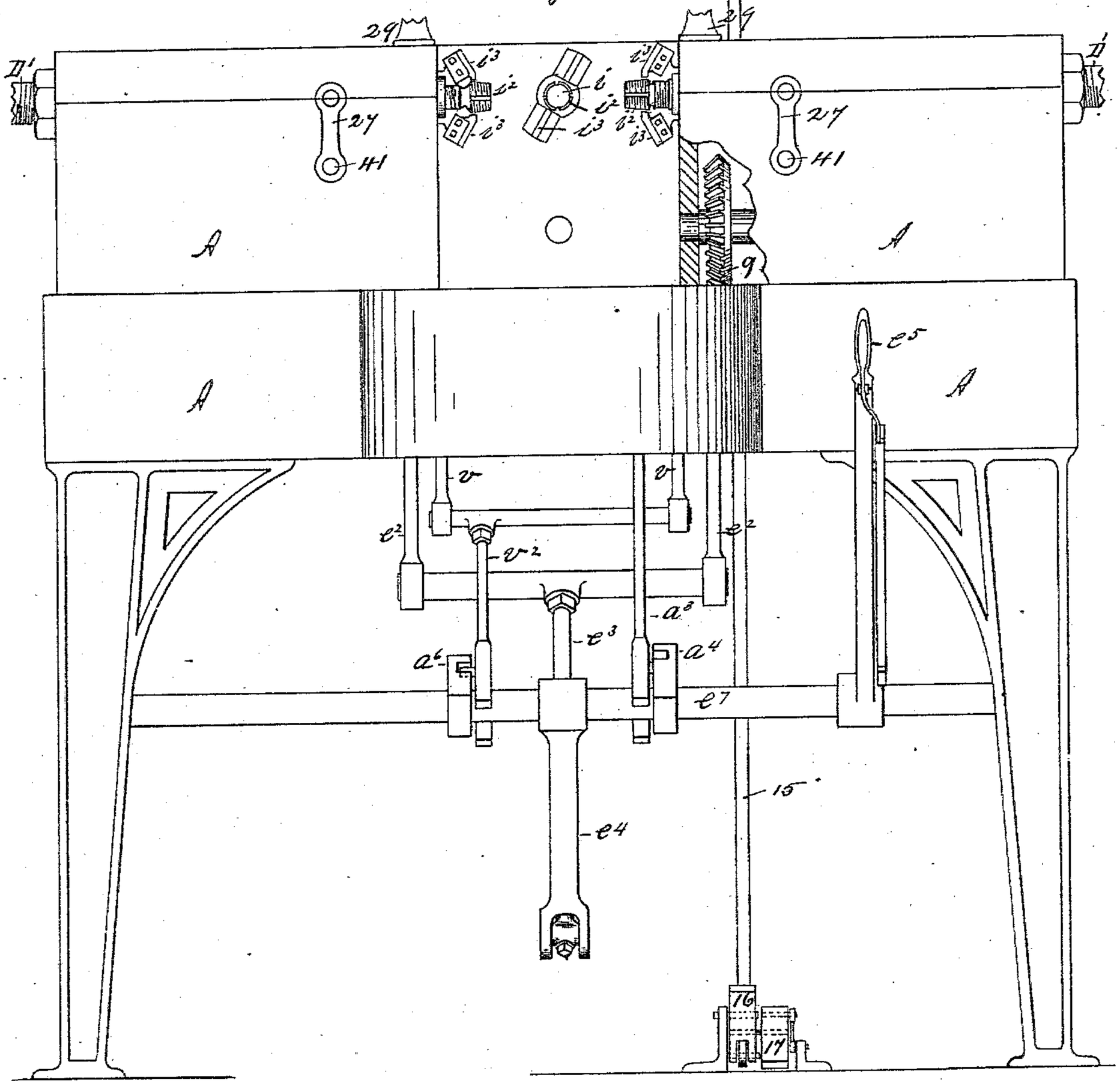


Fig 3



Witnesses
Henry Knox.
Wm H Chaplin

Inventor
Francis H Richards
By Henry A Chaplin
Atty

(No Model.) 4 Sheets—Sheet 4.

F. H. RICHARDS.

MACHINE FOR FINISHING GLOBE VALVE BODIES.

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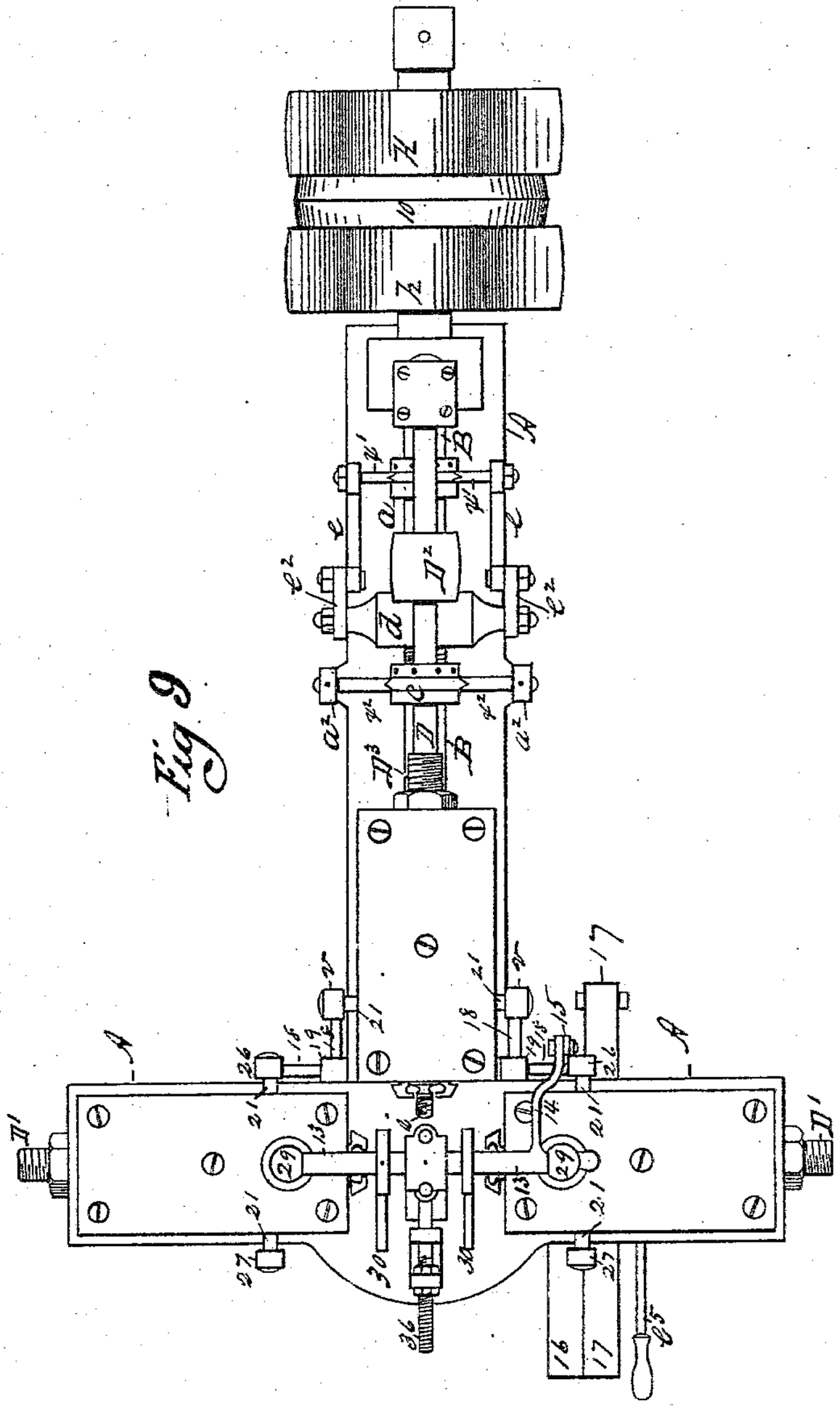
Fig 9



WITNESSES

Henry Knox

Wm. H. Chapin.

INVENTOR

Francis H. Richards

By Henry A. Chapin

ATTORNEY

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO THE JOEL HAYDEN BRASS COMPANY, OF LORAIN, OHIO.

MACHINE FOR FINISHING GLOBE-VALVE BODIES.

SPECIFICATION forming part of Letters Patent No. 281,138, dated July 10, 1883.

Application filed October 26, 1882. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Machines for Finishing Globe-Valve Bodies, of which the following is a specification.

This invention relates to machines for operating tapping, facing, and seat-forming tools in the manufacture of globe-valves and other articles which, in the process of construction, require that several holes be tapped therein both in line with each other and at right angles to each other; and it consists in the combination, with suitable reversely-operating driving mechanism adapted to drive three controlling-shafts, two of which run in line with each other and at right angles to the main one, of three tool-carrying shafts whose rotary movements are controlled by said first-named shafts, of facing-tools and sleeves supported upon and rotating with said tool-shafts, of a seat-cutting tool and shaft, of means for giving to the latter and to said tool-sleeves simultaneous advancing and retreating movements relative to the object being operated upon, and of appliances for holding the work firmly in the machine while being tapped, faced, and seated, the object being to provide a machine adapted to screw, face, and seat a globe-valve body at one operation, or to screw and face the same or other analogous article having several holes to be finished, doing all of said holes simultaneously and at one operation.

In the drawings forming part of this specification, Figure 1 is a side elevation, partly in section, of a three-way tapping, facing, and seating machine constructed according to my invention. Fig. 2 is a plan view, partly in section, with the work-holding appliances removed. Fig. 3 is an end view in which, as in Fig. 2, the work-holding devices are not shown. Fig. 4 is a front elevation, partly in section, of the central portion of the machine and parts of the last-named devices. Fig. 5 is a detail view of a portion of said devices. Figs. 6 and 7 are detail views. Fig. 8 is a side elevation, partly in section, of a part of the rear portion of the machine, as shown in Fig. 2. Fig. 9 is a plan view.

In the drawings, A is the frame of the machine, which is of cross form, as shown.

The reversely-operating main driving mechanism of this machine consists of a shaft, B, upon the rear end of which are mounted two loose driving-pulleys, *h h'*, adapted to be driven by belts or other suitable means in reverse directions.

Upon shaft B, between said pulleys *h h'*, is located a friction-clutch pulley, 10, adapted to rotate with and to slide on said shaft, so as to be engaged with the inner face of either one of said pulleys, or to be free from engagement with them. The rear end of said shaft B is hollow, and a rod, *x*, is fitted to slide therein and to rotate with it. The clutch-pulley 10 has an arm or stud projecting from the interior face of its hub through a slot in shaft B into a suitable perforation in said rod *x*, whereby said pulley 10 is so engaged with said rod that it can be moved back and forth between the pulleys *h h'* by sliding said rod.

Upon the forward end of shaft B is fixed a bevel-gear, 5. A second bevel-gear, 8, is supported upon the upper end of a suitable vertical shaft in frame A, and is adapted to be rotated in a horizontal plane by engagement with said gear 5.

In the front portions of the machine—that is to say, in those branching to the right and left from said centrally-located gear 8—are located two short shafts directly under the shafts D' D', Fig. 2, upon the ends of which, next to gear 8, are fixed bevel-gears 9, which engage with gear 8, and upon each of said short shafts, as well as upon the shaft B, is fixed a somewhat long gear, 6. The said short shafts to the right and left of gear 8 and that portion of shaft B carrying gears 6 and 5 are substantially alike, and are adapted to have uniform speeds of rotation.

Three tool-carrying shafts, D^3 D' D', are located in frame A, the former one directly over the before-mentioned shaft B, and the two latter ones are directly over said two short shafts carried by gears 9, and are provided with gears 7, which engage with said long gears 6

thereon. The rear ends of said tool-shafts are screwed, and are adapted to rotate in nuts *b*, secured in frame A, whereby said shafts are given a simultaneously advancing and retreating motion when rotated first in one direction and then in another. The said screw-threads on the rear ends of the tool-shafts correspond in practice with the threads of the taps they carry. Said tool-shafts are hollow, and in the end of each next to the gear 8 is fixed a tap, i^2; but that one in the shaft D^3 is perforated longitudinally to permit of passing the long shank of the seating-tool *i* through it and screwing the latter into the end of the seating-tool shaft D, which extends into said tool-shaft from the rear nearly to the rear end of the said hollow tap therein, as in Fig. 2. Said seating-tool shaft D, together with said tool *i*, whose cutting end is located in advance of the end of said hollow tap, is rotated by means of a belt applied to the pulley D^2 thereon, and is given a longitudinal motion by devices hereinafter described. Said seating-tool *i* is of the usual form, and is adapted to cut a bevel-edged valve-seat in the globe-valve body 39 when forced into the latter and rotated. The said tool-shafts D^3 D′ D′ are provided with long sleeves E, which support on their outer ends and in close proximity to the sides of the taps *i* one or more facing-tools, i^3. Said facing-tool sleeves E are adapted to slide back and forth on the said tool-shafts through connection therewith of devices hereinafter described, which engage with corresponding collars, 22, secured to each sleeve, a suitable pin or spline-key extending from said collars through said sleeves and into a longitudinal slot in the tool-shaft, whereby said sleeves are caused to rotate with the latter and are free to slide thereon within the limits of the length of said slot.

A rock-shaft, e^7, is hung under the front end of the machine, and is provided with a hand-lever, e^5, for operating it. An arm, e^4, is secured to said shaft and is connected with a cross-bar between the lower ends of two pivoted levers, e^2, by a connecting-rod, e^3. Said levers e^2 extend up each side of frame A, and are pivoted to the outer ends of a bar, *d*, which bar is perforated transversely, and has a screw-thread cut therein to adapt it to be screwed onto shaft B, which is likewise provided with a short screw-thread for that purpose, as in Fig. 1. Said bar *d* has an arm on its under side, which reaches into a slot in frame A, as in Fig. 8, whereby the motion of said bar on shaft B is made more steady. The upper ends of said levers e^2 extend upward and rearward beyond the ends of block *d*, and are connected by two bars, *e e*, to two arms, *x′ x′*, which engage with a collar, *a*, which is adapted to slide on shaft B, and thereby actuate the rod *x* within said shaft and the friction-clutch pulley 10. The construction of said collar is clearly shown in the enlarged detail view, Fig. 7, in which are shown sections of shaft B and rod *x*. A pin, 23, passes through one end of said collar, and through rod *x*, and through slots in the sides of shaft B, thereby effectually pinning said collar to said rod, but allowing both of the latter to move longitudinally within the limits of the length of said slots. The arms *x′* engage with a central ring between a fixed ring on one end of said collar and a nut, 24, on its opposite end. An arm on the under side of said central ring on collar *a* engages with the above-mentioned slot in frame A under shaft B, for the same purpose as that above explained relative to the arm on bar *d*. A cam, a^4, provided with an eccentric groove in one side thereof, is fixed on the rock-shaft e^7, and a connecting-rod, a^3, having a forked end, whereby it rests on said shaft, is provided with a pin through it, which enters said eccentric groove in cam a^4, and the rear end of said connecting-rod is secured to the lower ends of two pivoted levers, a^2 a^2, which are united similarly to the aforesaid levers e^2 by a cross-bar. Said last-named levers carry two arms, x^2 x^2, which engage with a central ring on a collar, *c*, which is secured to the seating-tool shaft D.

The purposes for which this machine is constructed require that the movements of all of the facing-tools i^3 in three directions against the ends of the valve-body or other article being operated upon should be as nearly as possible identical in degree, and that they should be isochronal, so that the comparatively slight cuts required to properly accomplish the facing shall be of suitable and uniform depth, and the movements of the tools be under the absolute control of the operator, for said facing-tools perform their functions while the taps i^2 and the seating-tool *i* are operating very rapidly.

As above described, corresponding collars, 22, made substantially like collar *a* on shaft B, (omitting pin 23,) are secured to the three facing-tool sleeves E, and connection is made between said collars and between the latter and the rock-shaft e^7, as follows:

Two vertical levers, *v v*, each having an arm, 25, (see Figs. 1, 2, and 6,) extending toward the front of the machine, are pivoted on the ends of a shaft, 28, which passes through frame A. Said arm 25 is located about opposite the end of said shaft, and the upper ends of said levers *v* extend upward above said shaft and to about opposite the axial line of shaft D^3. The upper ends of levers *v* have secured to them the arms 21, which are connected with the aforesaid central ring on collar 22 on the sleeve E, which incloses shaft D^3. Shafts 41, Figs. 3 and 6, pass through frame A under shafts D′ D′, located relative to the collars 22 thereon as said shaft 28 is to the collar 22 above the latter, and on the rear end of each of said shafts 41 is secured an elbow-lever, 26, one arm of which extends upward and the other horizontally toward the corner in frame A. A vertical lever, 27, is secured on the front end of each of said shafts 41, and

the upper ends of said elbow-levers 26, and levers 27 are provided with arms 21, which engage with central rings on the collars 22 on the sleeves E on the shafts D^3.

The horizontal arms of levers *v* and 26 are each provided with a horizontal cylindrical rod, 18, which is fixed thereto. A species of universal joint is formed for uniting the ends of said rods to a device whereby the motion of one is communicated to the other by means of the rectangular blocks 1919, which are pinned together, face to face, by the pin 20, but having the faculty of oscillating on said pin. The ends of the aforesaid rods 18 enter freely into suitable perforations in the edges of said blocks 19.

The above-described joint-connections are duplicated, as shown, and by means thereof the vibratory movements of the levers *v*, operating the sleeve E on shaft D^3, are accurately transmitted, without lost motion, to said levers 26 and 27, whereby the movements of said sleeves on shafts D′ D′ are made to conform to that on shaft D^3. The lower ends of said levers *v* are united by a cross-bar under frame A, to which is connected a rod, v^2, having a fork-shaped front end, whereby it may rest on shaft e^7, and is provided, like rod a^3, with a pin, which enters an eccentric groove in the side of a cam, a^6, which is fixed on shaft e^7.

The devices for holding the valve-bodies and other articles while being operated upon by the above-described tools are adapted to hold the same rigidly in position while said tools approach from three points and do their work; and they consist of a pair of heavy tongs, 40, having concave jaws 37 38, adapted to grasp the body of the valve between them, and a pair of clamp-jaws, 32 33, adapted to receive between them the jaws of said tongs inclosing said valve-body, as shown in Fig. 5.

A shaft, 13, having three eccentric bearings formed thereon, is hung in standards 29, Figs. 4 and 9. An arm, 14, on said shaft is connected by a rod, 15, with the end of a treadle, 16, by which said shaft is rocked in one direction, and a treadle, 17, connected to treadle 16, between its fulcrum and rod 15, serves to reverse the motion of said shaft. Two curved clamp-jaw supports, 30 30, are hung on two of said eccentric bearings on shaft 13, so that they have a reciprocating vertical motion when said shaft is rocked. The clamp-jaw 33 is secured rigidly between the lower ends of said supports 30, and its face is grooved to receive the lower jaw, 37, of the tongs 40.

The upper clamp-jaw, 32, is hung upon a short pitman, 31, which is secured to the third or middle eccentric on shaft 13.

The two eccentrics upon which supports 30 are hung operate reversely to that upon which said pitman is hung, so that the rocking of shaft 13 will slide clamp 32 down, while supports 30 and clamp-jaw 33 will be lifted up, and vice versa.

Two steady-bolts, 34, are located in frame A, between the sides of supports 30, and said frame and the heads of said bolts bear against the outer faces of said supports. Lock-nuts are placed on said bolts, as shown, for the usual purpose.

A cross-bar, 35, is fixed in the under side of clamp-jaw 33, having an arm, 36, thereon, which is screwed (Figs. 1 and 9) and passes through a guide-block on frame A. By operating nuts on said arm the lower end of supports 30 and the jaw 33 are adjusted back and forth, and said arm and its fastening prevent any swinging of the lower ends of said supports. The arm 36 is capable of springing somewhat to allow of said adjustment.

The rods v^2, e^3, and a^3, above described as connecting the rock-shaft e^7 with the levers *v*, e^2, and a^2, are so connected with the latter that their lengths are adjustable by well-known screw devices, as shown, in order that the tools and operative parts whose movements they aid in controlling may be adjusted to proper relative positions.

The operation of my improvements in tapping, facing, and cutting the valve-seat in a globe-valve body is as follows: No preliminary operation upon said body is required; but it is taken as cast, placed between the jaws of the tongs 40, and the latter are placed between the clamp-jaws 32 33, as shown in Fig. 5. The operator then bears down on treadle 16, thereby rocking shaft 13 and causing said clamp-jaws to approach each other and to rigidly secure said valve-body in the position shown, which is with its pipe ends toward the taps in the shaft D′ D′ and its hub opening toward the tap and the seating-tool presented at the end of shaft D^3. It is understood that the driving-pulleys *h h′* are run one by an open and one by a cross belt, the one next the machine, or the inner one, being belted to run to the right (looking from the front end of the machine) and the rear one to the left, and that a belt on pulley D^2 drives shaft D. The position of the clutch-pulley 10 is intermediate betweeen said driving-pulleys, and the bar *d* occupies a position about midway between the ends of the screw on shaft B. The hand-lever e^5 is now swung downward, with the following results: Through arm e^4, rod e^3, and levers e^2 the collar *a* is moved on shaft B in a direction toward the front end of the machine, thus drawing the clutch-pulley 10 into engagement with said right-hand running-pulley *h* and shaft B, the gear 8, gears 9 and their shafts, and the three tool-shafts D^3 D′ D′, together with the three facing-tool sleeves E, are simultaneously given a rotary motion, and said tool-shafts, owing to their screw-connection with the fixed nuts *b*, all move forward, carrying the taps i^2 into the valve-body, whereby the aforesaid screw-threads are cut therein. The rotation of shaft B causes the bar *d*, to which the levers e^2 are pivoted, to move rearwardly, and, the upper ends of said levers being prevented from moving with said block, their

lower ends swing with the latter, and, drawing on arm e^4, they rock the shafts e^7, carrying the end of lever e^5 further down, and so operating cams a^6 and a^4 on said shaft as to feed forward, through their connection with levers v, the three facing-tool sleeves E, bringing tools i^3 against the ends and hub-rim of the valve-body, and, by their connection with levers a^2, moving shaft D forward and carrying the seating-tool i against the valve-seat, whereby the facing and seating are accomplished immediately that said taps have entered the valve-body. Should the force of the aforesaid engagement of the friction-pulley 10 with pulley h be insufficient to hold collar a against the rearward movement of levers e^2, as above described, the aforesaid rocking movement of shaft e^7 may be supplemented by the operator applying his hand to the end of lever e^5 and bearing down slightly. Said hand-lever is allowed to swing down a certain distance, according to the tapping and cutting being done, when its motion is arrested by some convenient fixed stop or by the operator, and when so arrested the continued rearward movement of the bar d will cause the upper ends of levers e^2 to swing back, and acting on collar a and rod x to move the clutch-pulley 10 and at once disengage it from pulley h, thereby stopping the machine. By now swinging lever e^5 upward, the clutch-pulley 10 is moved rearwardly and made to engage with the rear pulley, h, and the first described motions of said shafts and other parts are reversed and the tools are retired from the valve-body, all of its screws being completely cut, its ends faced, and its valve-seat formed. The hand-lever e^5 is now operated to move pulley 10 midway between pulleys $h\,h'$, and the machine is thereby stopped. The operator now presses his foot on treadle 17, thereby pulling down rod 15 and opening the clamp-jaws 32 33, and permitting the tongs 40, together with the valve-body, to be taken from the machine, when another body is placed therein and said operations are repeated.

When this machine is employed for cutting the threads in the ends of a pipe-fitting—such as a T—the use of the seating-tool i is dispensed with.

The facing-tools i^3 may be made in such form as may be desirable, either for making a flat or curved face around the openings in the valve or fitting.

What I claim as my invention is—

1. The tool-shafts D^3 D' D', capable, by means substantially as described, of simultaneous rotating, advancing, and retreating movements, the facing-tool sleeves E E E, carried on said tool-shafts and adapted to be rotated thereby, and mechanism, substantially as described, for simultaneously advancing and retreating said sleeves, combined and operating substantially as set forth.

2. The tool-shaft D^3, capable, by means substantially as described, of rotating, advancing, and retreating movements, the hollow tap carried by said shaft, the shaft D, and appliances, substantially as described, for rotating, advancing, and retreating it, and the seating-tool i, having its shank passing through said tap and secured to said shaft D, combined and operating substantially as set forth.

3. The tool-shaft D^3, capable, by means substantially as described, of rotating, advancing, and retreating movements, the hollow tap carried by said shaft, the facing-tool sleeve E, carried on said tool-shaft and adapted to be rotated thereby, mechanism, substantially as described, for advancing and retreating said sleeve, the shaft D, and appliances, substantially as described, for rotating, advancing, and retreating it, and the seating-tool i, having its shank passing through said tap and secured to said shaft D, combined and operating substantially as described.

4. The hollow threaded shaft B, the loose pulleys $h\,h'$, the friction-pulley 10, the rod x, the collar a, provided with the pin 23, the bars e, provided with the arms x', the bar d, levers e^2 e^2, rod e^3, and rock-shaft e^7, provided with arm e^4, and hand-lever e^5, combined and operating substantially as set forth.

5. The shaft D, the collar c, levers a^2 a^2, connected with the latter by arms x^2, shaft e^7, provided with lever e^5, the cam a^4, and the rod a^3, connected with said levers and adapted to engage with said cam, combined and operating substantially as set forth.

6. In combination, the lever v, provided with arm 25, the elbow-lever 26, the blocks 19 19, pin 20, and the rods 18 18, substantially as set forth.

7. The rock-shaft 13, having eccentric bearings thereon, the supports 30 30, hung on said shaft, the clamp-jaw 33, secured between said supports, the clamp-jaw 32, secured by pitman 31 to said shaft, and appliances, substantially as described, for rocking said shaft, combined and operating substantially as set forth.

8. The combination, with the supports 30 30 and the clamp-jaw 33, secured thereto, of the steady-bolts 34 34 and the rod 36, secured by bar 35 to said clamp-jaw, and means, substantially as described, for securing said rod to the frame A, all as set forth.

FRANCIS H. RICHARDS.

Witnesses:

H. A. CHAPIN,

R. F. HYDE.