(No Model.)

3 Sheets—Sheet 1.

F. H. RICHARDS.

VALVE BODY MILLING MACHINE.

No. 299,090. Patented May 20, 1884.

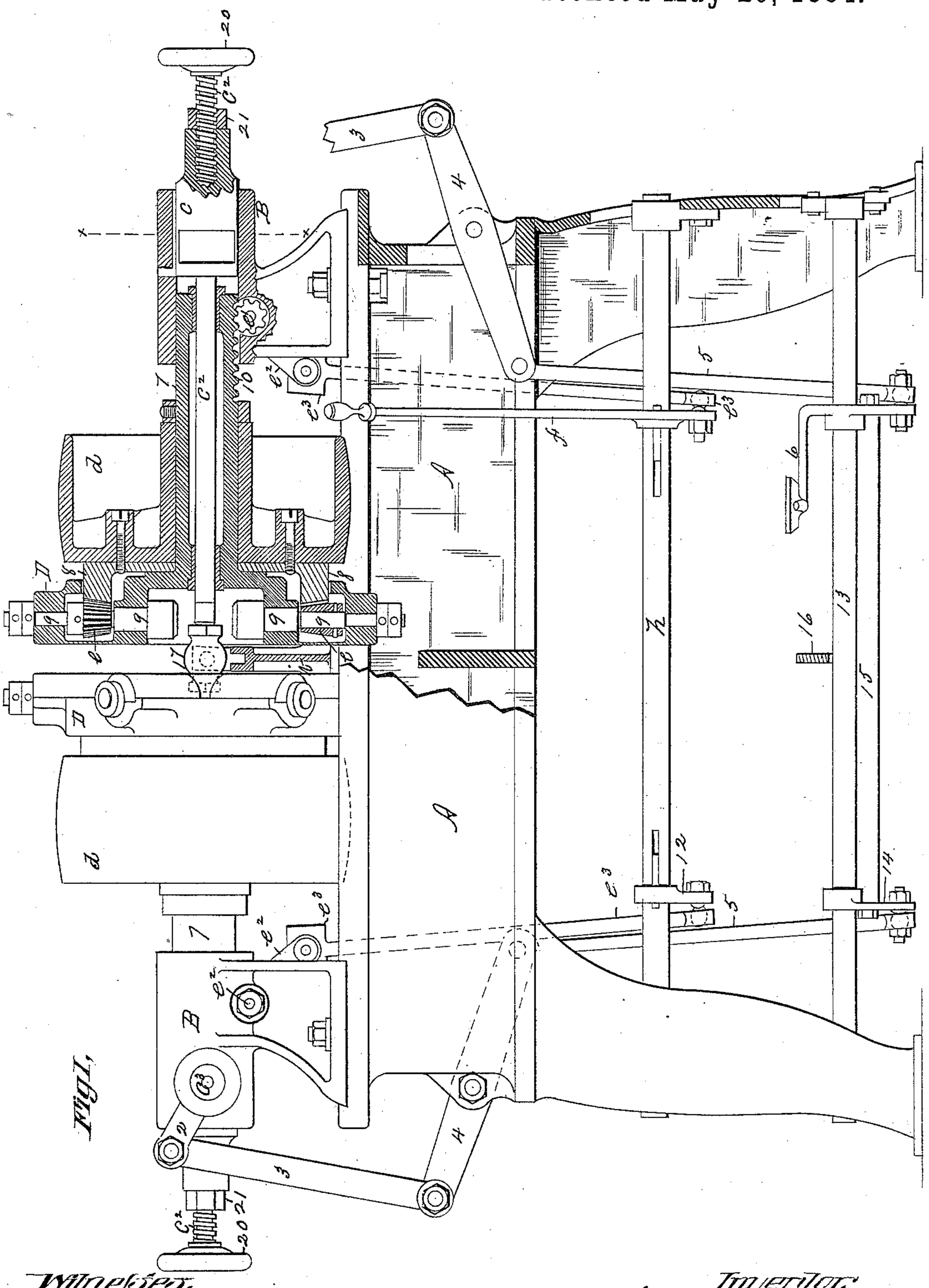

Fig. 1.

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Inventor:
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(No Model.) 3 Sheets—Sheet 2.

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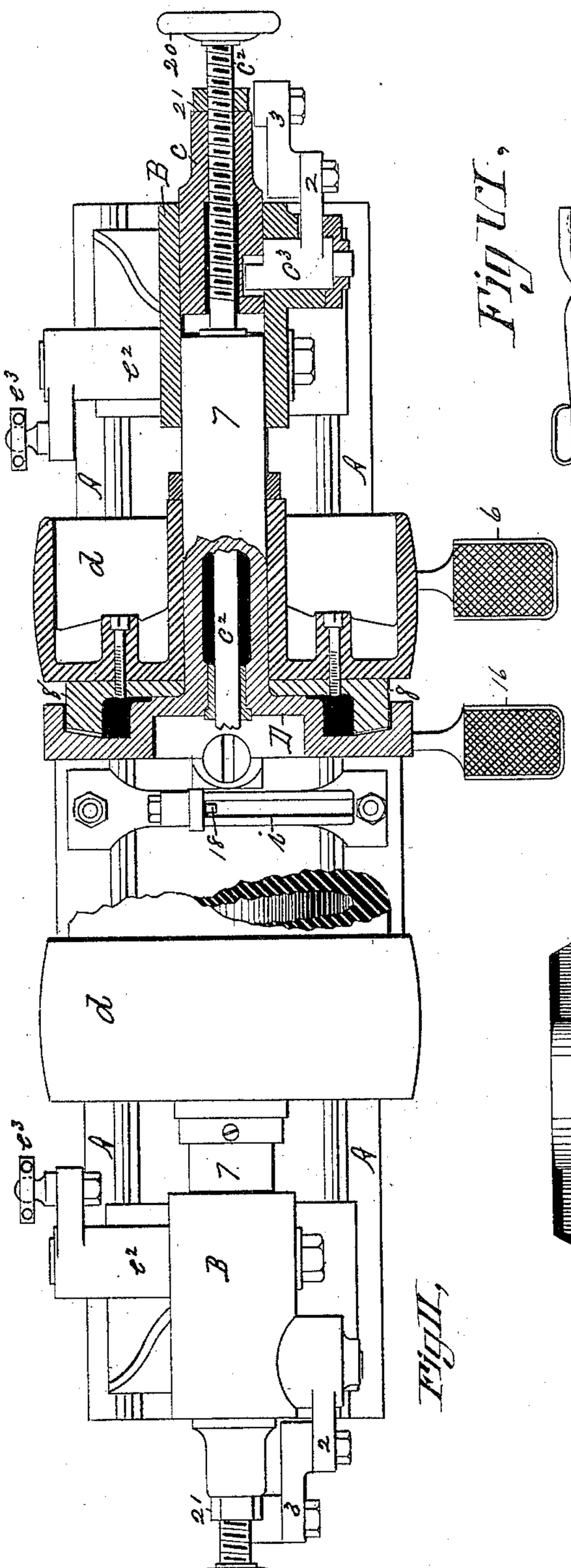

Fig. 1.

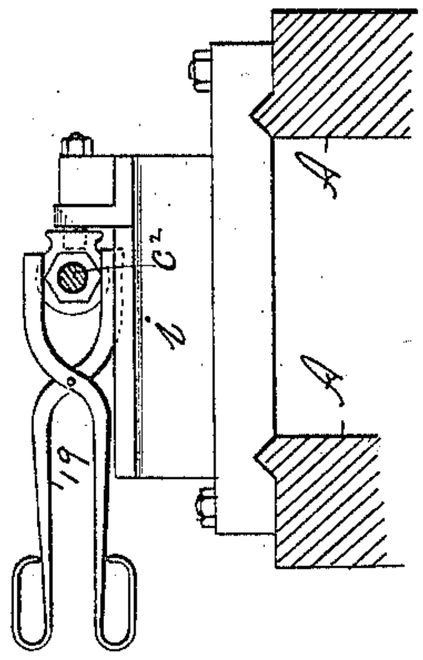

Fig. 4.

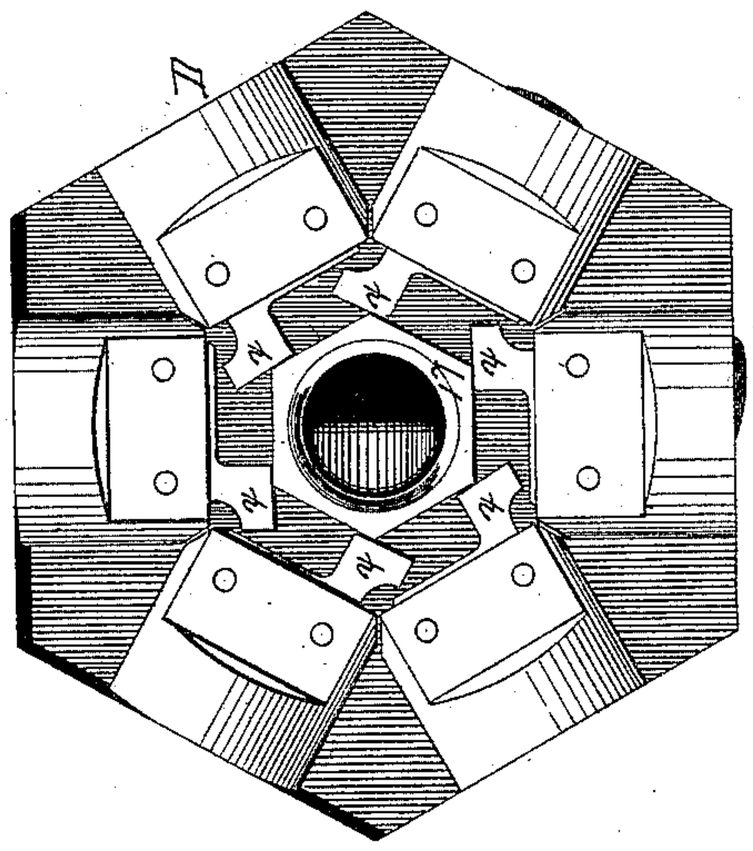

Fig. 5.

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3 Sheets—Sheet 3.

F. H. RICHARDS.

VALVE BODY MILLING MACHINE.

No. 299,090. Patented May 20, 1884.

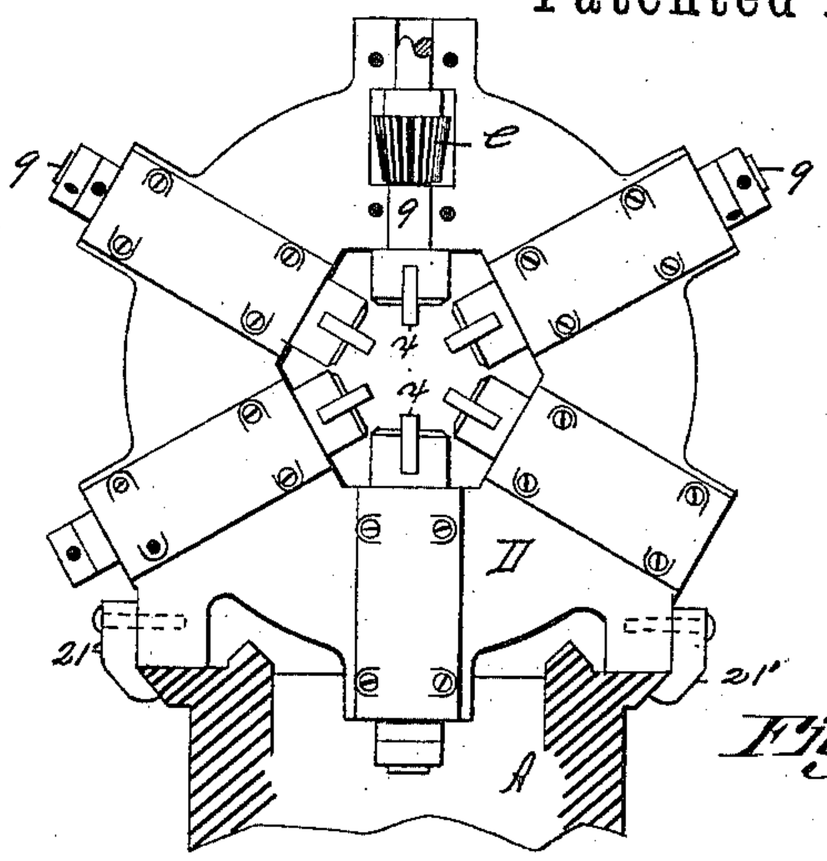

Fig III,

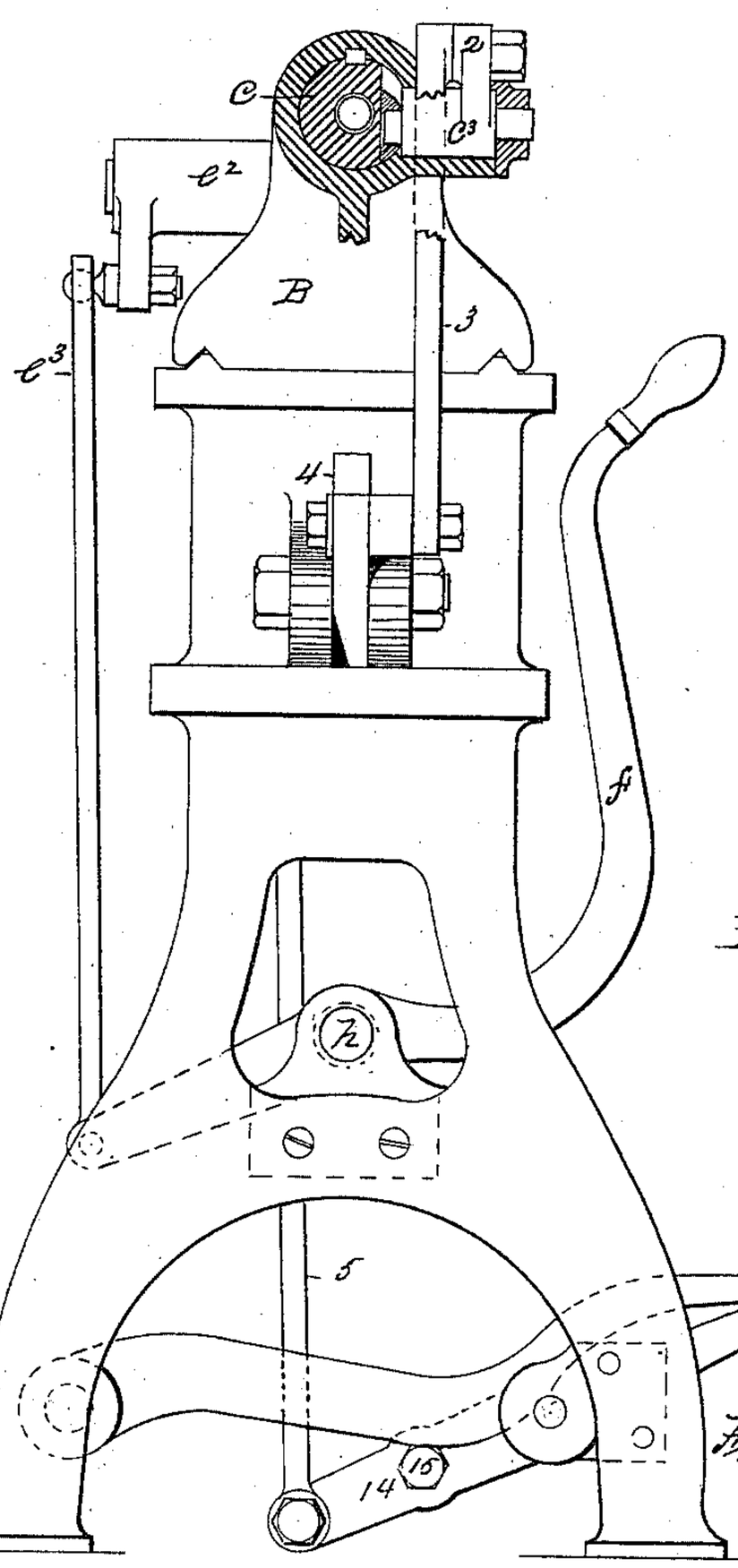

Fig II.

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UNITED STATES PATENT OFFICE.

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

VALVE-BODY MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 299,090, dated May 20, 1884.

Application filed August 14, 1883. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Valve-Body Milling-Machines, of which the following is a specification.

This invention relates to improved machinery for milling the ends of globe-valve bodies; and it consists in means for rigidly holding a valve-body on the machine, of cutter-heads provided with shafts and cutting-tools, and operating mechanism adapted to be moved to and from the ends of the valve-body, and of appliances for simultaneously grasping both ends of the valve-body to hold it while being operated upon, and for moving simultaneously the cutter-heads against and from the ends of the valve-body, the object being to provide improved mechanism for simultaneously milling the several faces of both of the hexagon-shaped ends of a valve-body or other similar object, whereby a great reduction in the cost of such work is effected, and whereby the work is better and much more rapidly accomplished.

In the drawings forming part of this specification, Figure I is a side elevation, partly in section, of a machine constructed for the above-named purpose and embodying my invention. Fig. II is a plan view, partly in section. Fig. III is an end elevation of the cutter-head, shown in connection with a section of the bed of the machine. Fig. IV is an end view of the machine, partly in section and not including the cutter-head. Fig. V illustrates the positions of the cutters and the end of a valve-body, relatively, when the latter is being operated upon by the former. Fig. VI illustrates a portion of the body holding and manipulating devices.

In the drawings, A is the bed of the machine supported on suitable legs. B B are head-stocks firmly secured to the bed. With each of said head-stocks and with one end of bed A is connected a cutter-head and a center spindle, and means for operating said parts, and the latter being the same on each end of the machine a description of the mechanism of one end will apply to that of the other. Said head-stock B is bored out longitudinally to receive a sliding nut, *c*, through which the center spindle, c^2, operates, turned by the hand-wheel 20. The spindle c^2 extends to the central part of the machine, and is adapted to have its pointed end enter slightly the end of a valve-body, as shown. The spindle c^2 is adjusted longitudinally in nut *c* by turning it, and the latter is given a sliding movement in the head-stock by its connection with the crank-stud c^3. A crank on the inner end of the latter engages with a transverse slot in the side of nut *c*, (see Fig. II,) so that when the stud c^3 is given a rotating motion the nut and spindle c^2 are given a longitudinal movement. The crank-stud c^3 is fitted in a suitable bearing on the side of the head-stock, and is provided with an arm, 2, and is given a reciprocating rotary motion by its connection with a lever, 4, by a connecting-rod, 3. The said lever is given a vibratory motion by the treadles 6 and 16, it being connected with the former by the rod 5. A shaft, 13, is supported between the legs of the machine, on which is secured said treadle 6, and an arm, 14, is likewise secured on said shaft. A bar, 15, is secured between and by each end to the said treadle 6 and arm 14, somewhat removed from the shaft 13. The treadle 16 is hung at the rear side of the machine, and is adapted to extend from thence to the front of it, resting upon the bar 15. Thus after treadle 6 has been borne down, it is given a reverse motion (together with the parts connected with it) by bearing down on treadle 16.

The cutter-head D consists of a shaft-case of circular form, having bearings therein for a series of cutter-shafts, 9, supported in suitable bearings in lines radiating from its center, and has a bearing upon the bed A. Gibs 21, secured to said head and hooking under the outer edges of the bed, secure the head thereto and permit it to be moved thereon. A shaft, 7, which is hollow, extends from the side of the cutter-head next to the head-stock, and enters the portion thereof in which nut *c* slides, and a rack, 10, is formed on the under side of said shaft.

A pinion-shaft, e^2, having a crank-arm thereon, is supported on the rear side of the head-stock B, and, extending under shaft 7, carries on it a pinion, e', which engages with the said rack 10. A connecting-rod, e^3, is secured by one end to the said arm on shaft e^2 and by its

opposite end to a hand-lever, *f*. The hand-lever *f* is secured to a rock-shaft, *h*, carrying an arm, 12, which performs the same function as does the short arm of lever *f*. The said shaft 7 is provided with suitable interior bearings at each end for supporting the spindle c^2, which passes through it. By vibrating the hand-lever *f* the pinion *e'* is turned and the cutter-head is given a longitudinal reciprocating movement on bed A.

The cutter-shafts 9 in the head D are each provided with a bevel-pinion, *e*, and are adapted to have the cutters *x* secured thereto in such relative positions that when they rotate they interlock and pass each other without coming in contact.

A belt-pulley, *d*, is fitted to revolve on the shaft 7, and has a circular face-gear, 8, bolted to its side, which is adapted to engage with the pinions *e* on the cutter-shafts, whereby the latter and the cutters *x* are given a rapid rotary motion when a belt is applied to said pulley. Pulley *d* and the gear 8 are retained in proper position on shaft 7 by a suitable collar, as shown.

A valve-body support, *i*, is secured to bed A, between the two cutter-heads, and has a post on its rear end provided with a stud, 18, which enters the hub-hole of the valve-body 17 when the latter is held between the cutter-heads. For the purpose of placing the valve body on support *i* conveniently, tongs 19, for grasping the body and adapted to have one jaw slide in a groove in said rest, are employed.

The operation of the machine is as follows: A belt is applied to each of the pulleys *d*, setting in motion the cutter-shafts and cutters of each head D. Before putting a valve-body onto the machine, the operator grasps lever *f*, drawing toward him, and, as before described, rotating the pinions *e'* and moving both cutter-heads at the same time away from the body-support *i* toward the head-stocks B. The operator then adjusts the center spindles, c^2, by turning them in nuts *c*, so that when they are moved toward each other, as hereinafter described, their central points will each enter the valve-body at opposite ends and clamp it between them. The spindles c^2 are made to slide back from each other by bearing down on treadle 16, and are locked in their adjusted positions by nuts 21. A valve-body, 17, is now taken by the tongs 19 and placed on support *i*, stud 18 on the latter entering its hub-hole. Treadle 6 is then pressed down, driving spindles c^2 against the ends of the body, as shown in Fig. 1. Thus, by being held against stud 18 the body cannot turn, and said spindles hold it rigidly against longitudinal movement. The operator now swings lever *f* toward the machine, moving both cutter-heads at once, and the cutters *x* against the ends of the valve-body, which the cutters attack, as illustrated in Fig. V, simultaneously milling the six faces of each end of the body. The cutters travel across the plane faces of the valve-body from edge to edge in curved lines, the first cut being at the end of the body, and each succeeding cut a little farther in. The cutters overrun the edges of the plane faces, as shown; but as they move together they do not interfere with each other. The cutters are fed forward until the plane faces of the valve-body are dressed. Lever *f* is then reversed, moving the cutter-heads back, as before, and treadle 16 is operated, as above stated, bringing the parts in such position as permits the milled body to be removed and another one to be placed on the machine, and the operations are repeated.

What I claim as my invention is—

1. A valve-body milling-machine consisting of the following elements, viz: two cutter-heads, each provided with a series of cutter-shafts, arranged in lines radiating from its center, two center spindles passing through said cutter-heads from each end of the machine, means, substantially as described, for rotating said cutter-shafts, and means, substantially as described, for imparting to said cutter-heads and to said center spindles, respectively, simultaneous movements toward and from each other, combined and operating substantially as set forth.

2. A cutter-head for operating a series of cutters around a common center, consisting of a suitable case having a series of cutter-shafts arranged in lines radiating from its center, a driving face-gear wheel, 8, supported in one side of said case, and having geared connections with all the cutter-shafts, and a belt-pulley concentric with and secured to said driving-gear wheel, whereby all the cutter-shafts are driven simultaneously, substantially as described.

3. In combination, the head-stock B, the nut *c*, capable of a sliding movement in said head-stock, the center spindle, c^2, passing through said nut, and means, substantially as described, for imparting to said nut a forward or backward movement, combined with cutter-heads of the character described surrounding said spindle in said head-stock, all as set forth.

4. In combination, the cutter-head D, having a bearing on the bed A and a pulley-shaft thereon entering the head-stock B, and provided with a rack, 10, the pinion *e'*, engaging with said rack, the head-stock B, and means, substantially as described, for giving to said pinion a reciprocating rotary motion, as set forth.

5. In combination, the support *i*, provided with the stud 18, the spindles c^2 c^2, and means, substantially as described, for imparting to said spindles simultaneous and equal movements toward and from said support, substantially as set forth.

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H. F. L. ORCUTT.