(No Model.) 2 Sheets—Sheet 1.

C. E. GOULD.

MACHINE FOR GRINDING METALLIC FORMS.

No. 435,495. Patented Sept. 2, 1890.

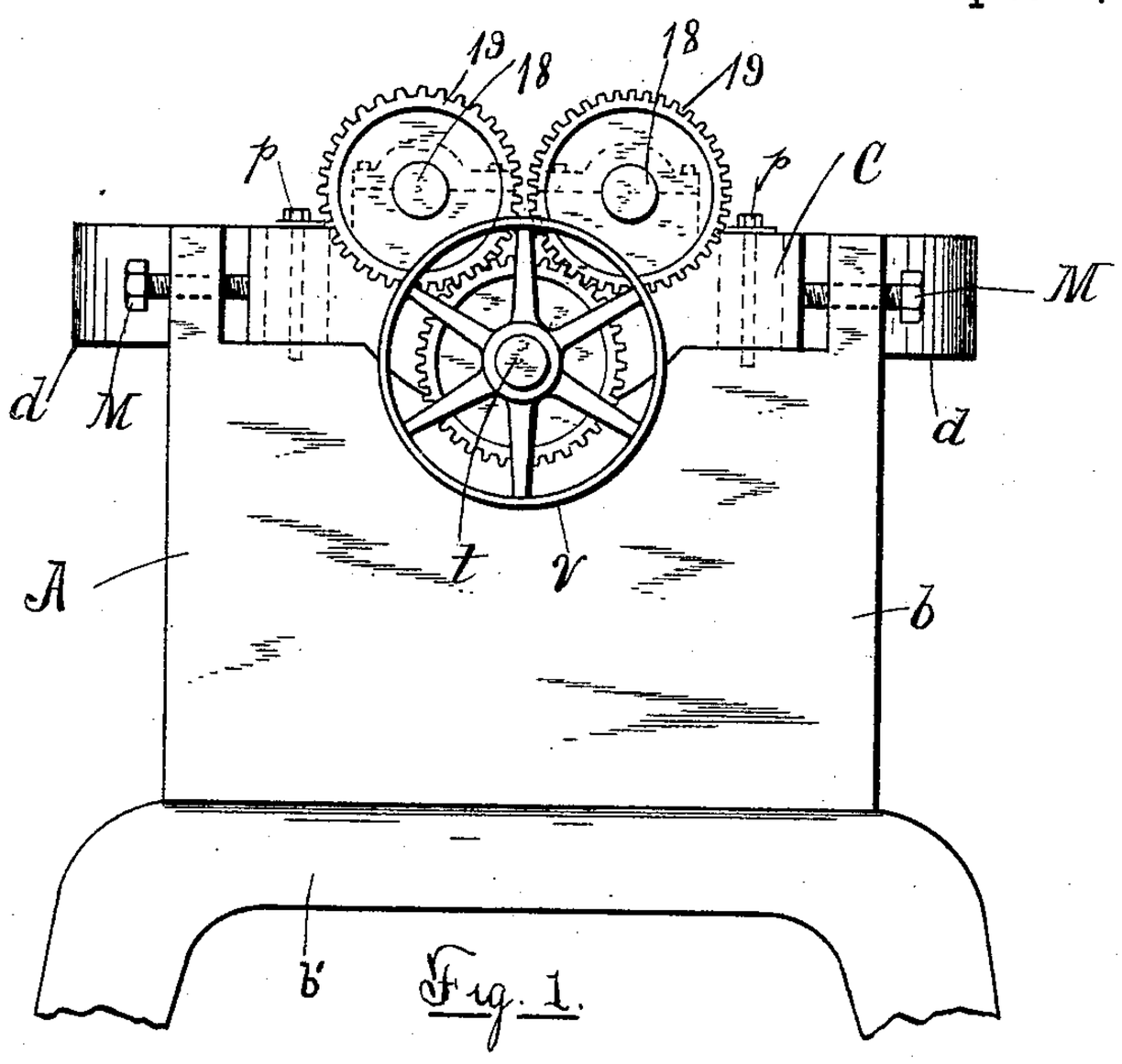

Fig. 1.

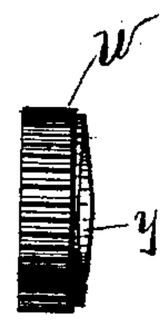

Fig. 7.

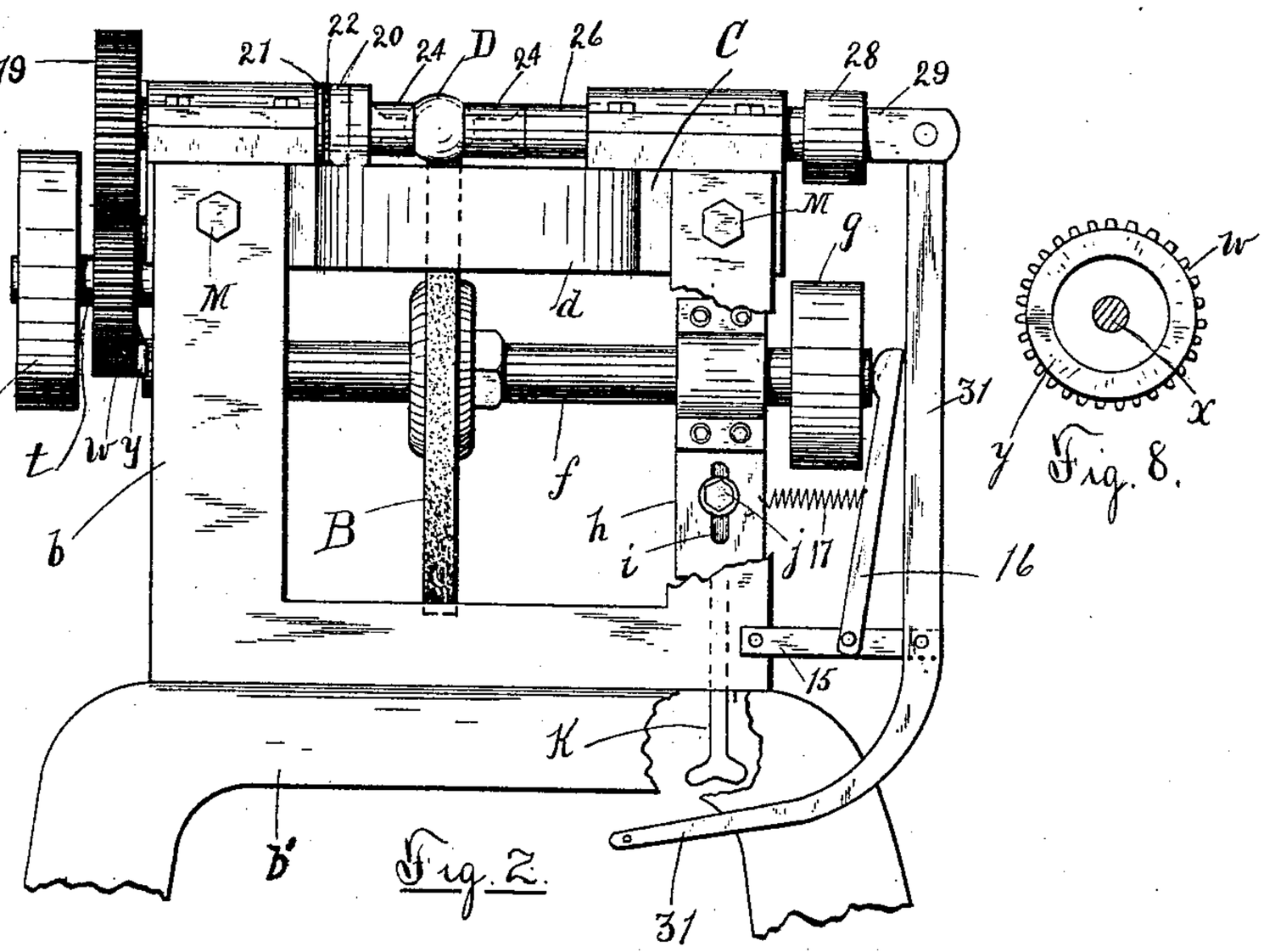

Fig. 2.

Fig. 8.

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(No Model.) 2 Sheets—Sheet 2.

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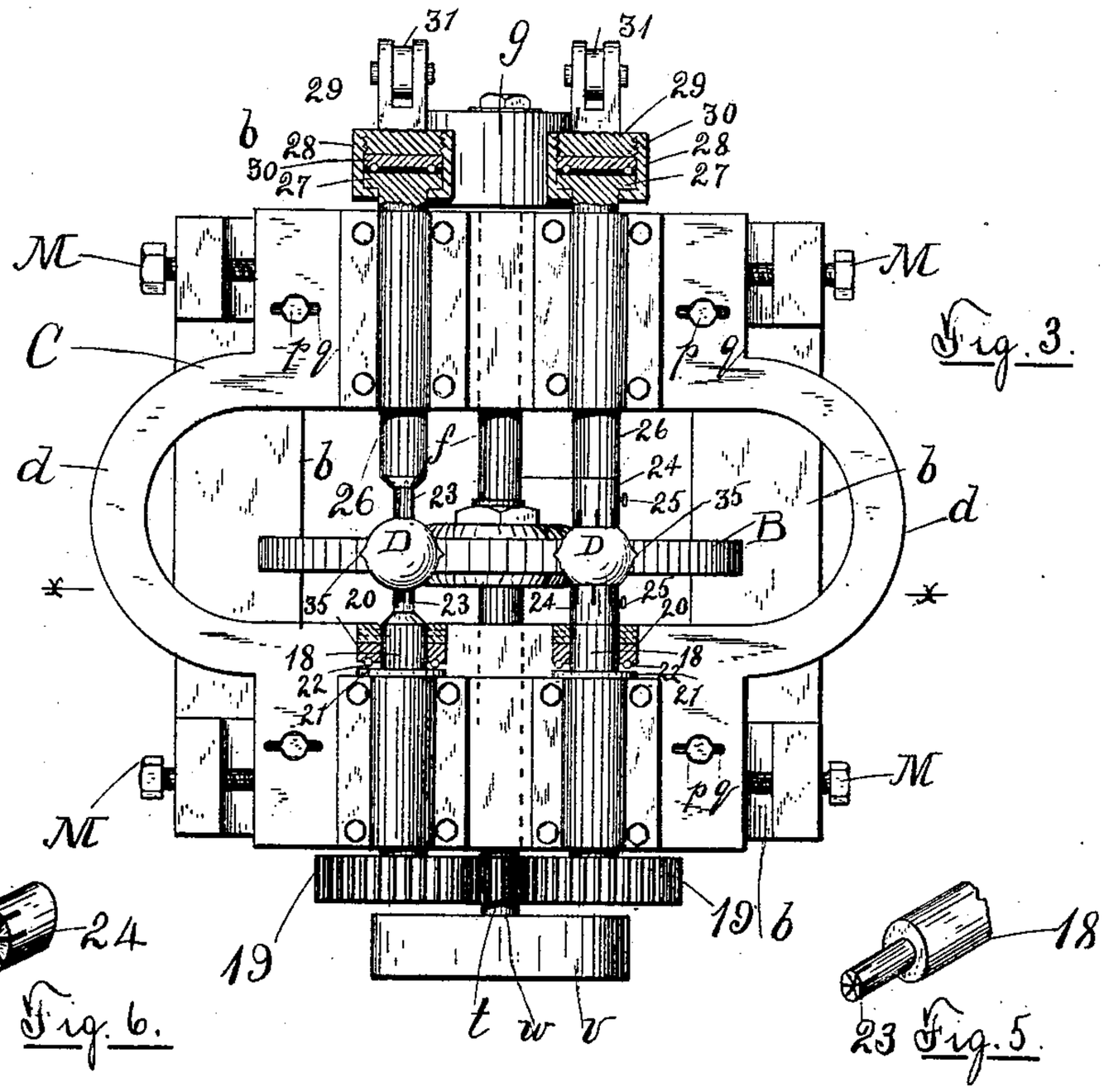

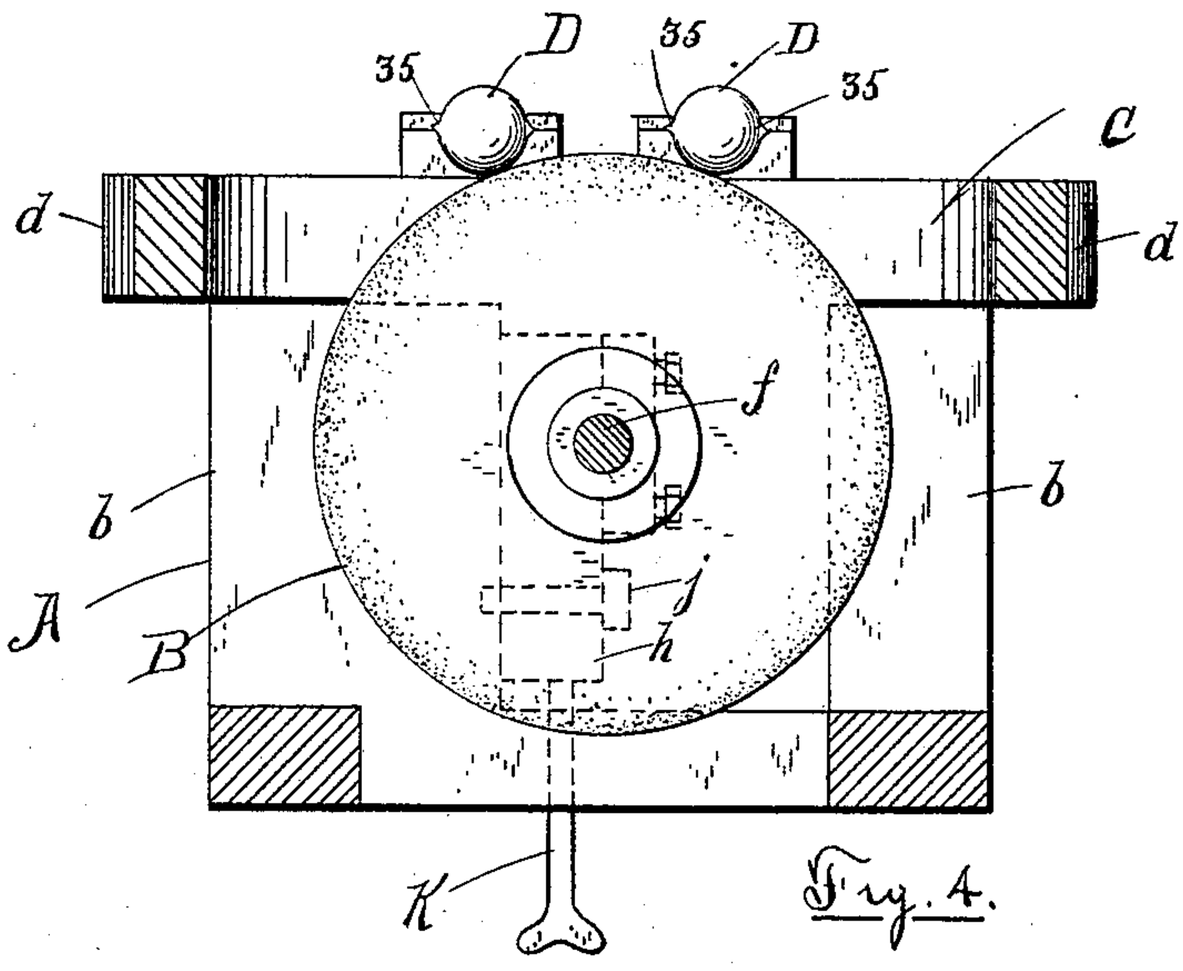

Fig. 4.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR GRINDING METALLIC FORMS.

SPECIFICATION forming part of Letters Patent No. 435,495, dated September 2, 1890.

Application filed November 7, 1889. Serial No. 329,505. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. GOULD, of Leominster, in the county of Worcester, State of Massachusetts, have invented certain new and useful Improvements in Machines for Grinding Metallic Forms, of which the following is a description sufficiently full, clear, and exact to enable any person skilled in the art or science to which said invention appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an end elevation of my improved machine; Fig. 2, a front elevation of the same; Fig. 3, a top plan view partly in section; Fig. 4, a central vertical transverse section of the machine; Fig. 5, an enlarged perspective of one of the form-holders; Fig. 6, a like view of a holder-sleeve detached; and Figs. 7 and 8, respectively an edge and side elevation of the cam-gear.

Like letters and figures of reference indicate corresponding parts in the different figures of the drawings.

In shaping metallic balls and other forms by rolled forging wherein grooved dies having cutting-bosses are employed, a teat or projection is left thereon. A metallic ball is employed in the present instance to illustrate the operation of my invention, which relates especially to mechanism for grinding away said projections; and it consists in certain novel features hereinafter fully set forth and claimed, the object being to produce a simpler, cheaper, and more effective device of this character than is now in ordinary use.

The nature and operation of the improvement will be readily understood by all conversant with such matters from the following explanation.

In the drawings, A represents the frame or body of the machine, which consists, primarily, of two vertical end pieces *b*, supported on a base *b'*.

A horizontal shaft *f* is journaled centrally in the end pieces and is fitted to slide longitudinally in its journals. A driving-pulley *g* is mounted on the outer end of said shaft, and a grinding-wheel B is secured centrally thereto.

A journal of the shaft *f* is secured to a block *h*, (see Fig. 4,) and a set-screw *i*, passing through a slot *j*, holds said block on the frame. This journal-block is adjustable vertically by means of a thumb-screw *k*, passing through the bottom of the frame, and the wear on the grinding-wheel may thus be compensated for.

A horizontal frame C, having curved or bowed side pieces *d*, is adjustable laterally on the tops of the end pieces *b* of the body A. Set-screws M in said body hold the horizontal frame in position. Set-screws *p*, passing through slots *q* in the frame C, prevent vertical movement thereof on the body A.

A horizontal stub-shaft *t* is journaled in one end of the frame C in the same vertical plane as the shaft *f*, said shaft *t* bearing a driving-pulley *v* and a gear *w*. The inner face of the gear is provided with a circular cam-track *y*, which engages the adjacent end of the shaft *f* and forces said shaft longitudinally outward at each semi-revolution of said gear.

A horizontal lever 15, Fig. 2, is pivoted to the body A, and a vertical lever 16 is pivoted by its lower ends to said horizontal lever, its upper end engaging the end of the shaft *f*, opposite the gear *w*. A coiled spring 17 connects the lever 16 and machine-body, said spring acting contractively to return the shaft *f* after being moved by the gear-cam.

Two parallel shafts 18 are journaled on top of the frame C and bear gears 19 on their outer ends, which respectively mesh with the gear *w*. Each shaft 18 has a sleeve or collet 20 keyed thereto near its inner end, and the inner end of the journal for each of said shafts is provided with an annular bearing-plate 21. A series of balls 22 is interposed between each of the collets 20 and the adjacent bearing-plate 21, whereby an anti-friction thrust-bearing is formed for each of the shafts 18, so that the friction caused by the outward pressure upon said shafts is very much reduced. Moreover, these anti-friction thrust-bearings assist in holding the shafts in alignment. The inner ends of the shafts 18 (see Fig. 5) are reduced and furcated or slotted longitudinally, as shown at 23. Their extreme ends are also grooved or hollowed to receive a portion of

the surface of the balls D, said ends forming one section of the ball-holders. A sleeve or cap 24 (see Fig. 6) is adapted to receive the reduced end 23 of the shaft, said sleeve being slotted and grooved in like manner to engage the sides of a ball D. The cap is held in position by a set-screw 25, as shown in Fig. 6, and is employed when larger balls are being ground than can readily be held by the shaft end. Similar horizontally-arranged shafts 26 are journaled at the rear of the frame C and in alignment with the respective shaft 18. Said shafts 26 have reduced inner ends grooved in like manner with the shafts 18 and form the opposite sections of the ball-holders. The ends of the shafts 26 may be slotted, if desired, and are adapted to receive the sleeves 24. A shoulder 27 (see Fig. 3) is formed on the outer end of the shafts 26 and rotates in a box 28. A hinge-block 29 is turned into the outer ends of said boxes, and a ball-bearing 30 is interposed between said blocks and the shaft ends. A treadle-lever 31 is hinged to the blocks 29 and pivoted to the horizontal lever 15, said lever being adapted to force the shafts 26 inward when depressed.

In the use of my improvement the balls D to be ground are adjusted between the adjacent ends of companion shafts 18 and 26 with their teats 35 in the vertical plane of the grinding-wheel B, as shown in Fig. 3, the surface of said balls engaging the working-face of said wheel. The treadle 31 is depressed, forcing the shafts 26 inward and securely clamping the balls. Power being applied to the pulleys *v g* the ball-shafts 18 and grinder-shaft *f* are rotated in opposite directions. The friction resultant from the end-thrust or longitudinal movement of the ball-shafts is practically overcome by the ball-bearings described and permits their free rotation. The shaft *f*, being reciprocated longitudinally by the gear-cam *y*, the spring-actuated lever 16 equalizes the wear of all portions of the periphery of the wheel B, and the vertical take-up on said shaft, actuated by the thumb-screw *k*, enables the greater portion of said wheel to be used before it becomes necessary to replace it. Slotted caps or sleeves 24 of any diameter may be employed on the ball-holder shafts, adapting the machine for use with balls varying greatly in size. The shafts 26 are freely rotated by the tension on the balls from the rotating shafts 18.

It will be understood that my improved device is equally well adapted for grinding the teats or projections from metallic forms other than the balls described. The slotted caps and holder-shaft ends enable any desired shape to be clamped therein, and the grinder-shaft being adjustable vertically can be set at any suitable distance from the holder.

Having thus explained my invention, what I claim is—

1. The combination of a rotary grinding-wheel, a shaft supporting said grinding-wheel, a support for the article to be ground, a cam for shifting the grinding-wheel shaft endwise during the grinding operation, and a spring-actuated lever for holding the shaft in contact with said cam.

2. In a machine for grinding metallic forms, a body, a rotary grinding-wheel, a form-holder comprising two shafts in alignment, treadle mechanism for moving one shaft longitudinally, and mechanism, substantially as described, for conjointly rotating the opposite holder-shaft and longitudinally reciprocating the grinder-shaft, substantially as described.

3. In a machine for grinding metallic forms, a rotary shaft provided with a grinding-wheel, mechanism for vertically adjusting said shaft, a gear provided with a cam in engagement with one end of said shaft for adjusting it endwise, and a spring-actuated lever in engagement with the opposite end thereof, whereby said shaft may be reciprocated longitudinally as the gear is rotated.

4. In a machine for grinding metallic forms, a body, a rotary grinder journaled therein on a vertically-adjustable shaft, a form-holder comprising two shafts in alignment and parallel with the grinder-shaft, and a treadle mechanism for moving one of said shafts longitudinally to clamp the form between their adjacent ends, substantially as set forth.

5. In a machine for grinding metallic forms, a body, a vertically-adjustable rotary grinder, a holder comprising two shafts in alignment parallel with the grinder-shaft, their adjacent ends being grooved to receive the form, mechanism, substantially as described, for conjointly rotating one of said shafts and longitudinally reciprocating the grinder-shaft, and mechanism for moving the opposite holder-shaft longitudinally to clamp the form, substantially as set forth.

6. In a machine for grinding metallic forms, a body, a stub-shaft bearing a pulley, and a gear provided with a cam-face, a rotary grinder having a longitudinally-movable shaft bearing a pulley, a spring-actuated lever engaging an end of said shaft, a holder comprising two rotary shafts in alignment having adjacent ends socketed, one of said shafts being driven by said gear, a treadle mechanism for moving the opposite holder-shaft longitudinally, and ball-bearings for said holder-shafts compensating the end-thrust thereon, substantially as and for the purpose set forth.

7. In a machine for grinding metallic forms, the holder-shaft 18, having the concaved and slotted reduced end 23, substantially as described.

8. In a machine for grinding metallic forms, the combination of a holder-shaft 18, having a reduced end 23 and a sleeve 24 on said reduced end and provided with a concaved and slotted end, substantially as described.

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