(No Model.) 2 Sheets—Sheet 1.

G. T. REISS & J. B. CROCKER.

MILLING MACHINE.

No. 547,740. Patented Oct. 8, 1895.

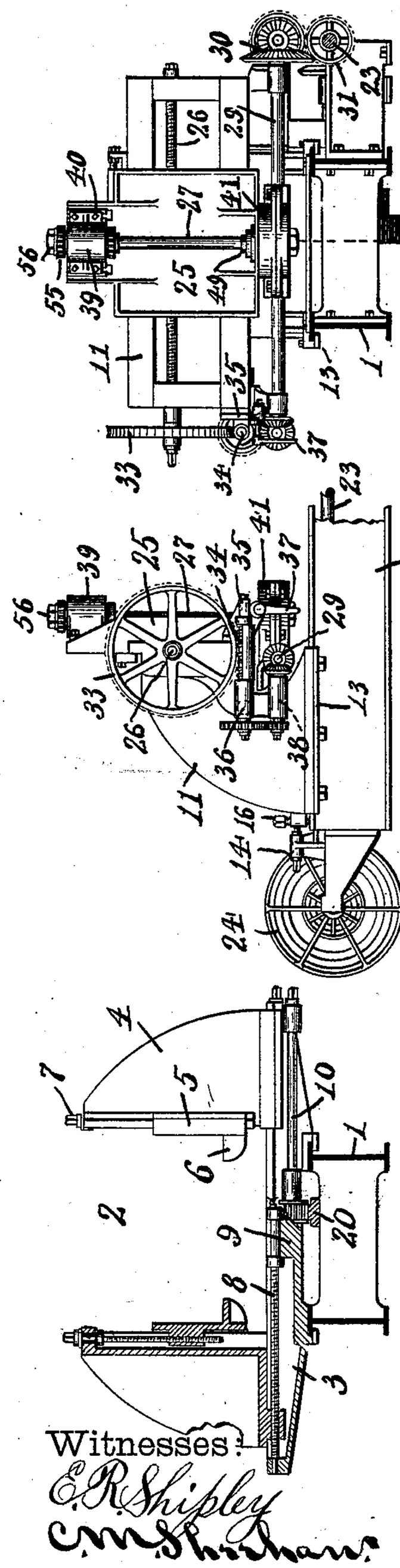


Fig. 2.

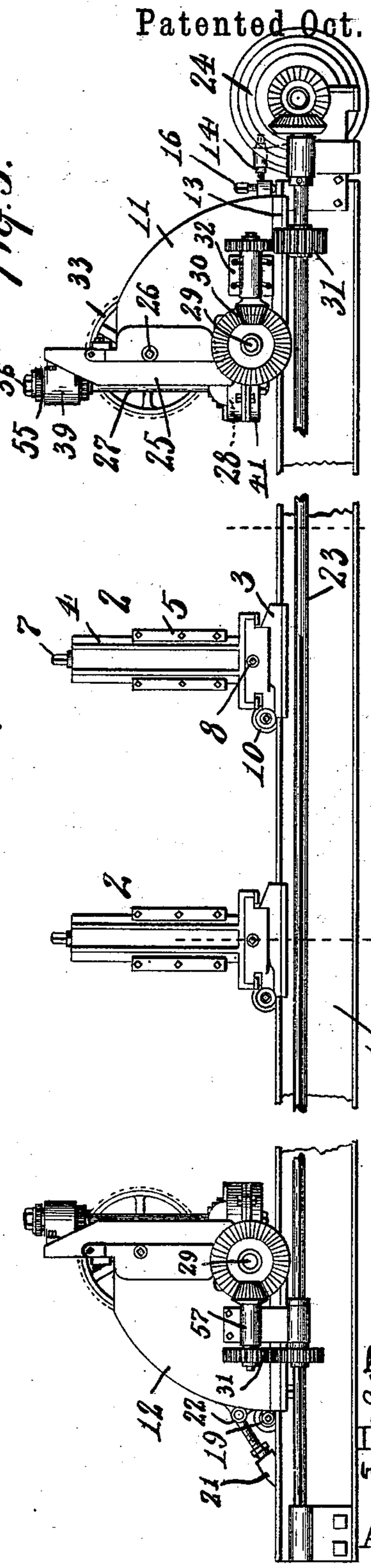
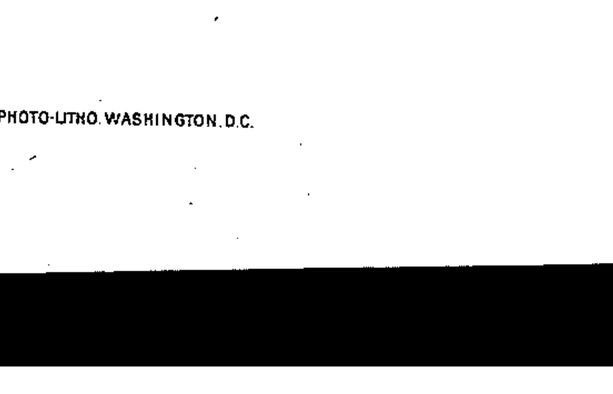


Fig. 3.

Fig. 4.

Fig. 1.



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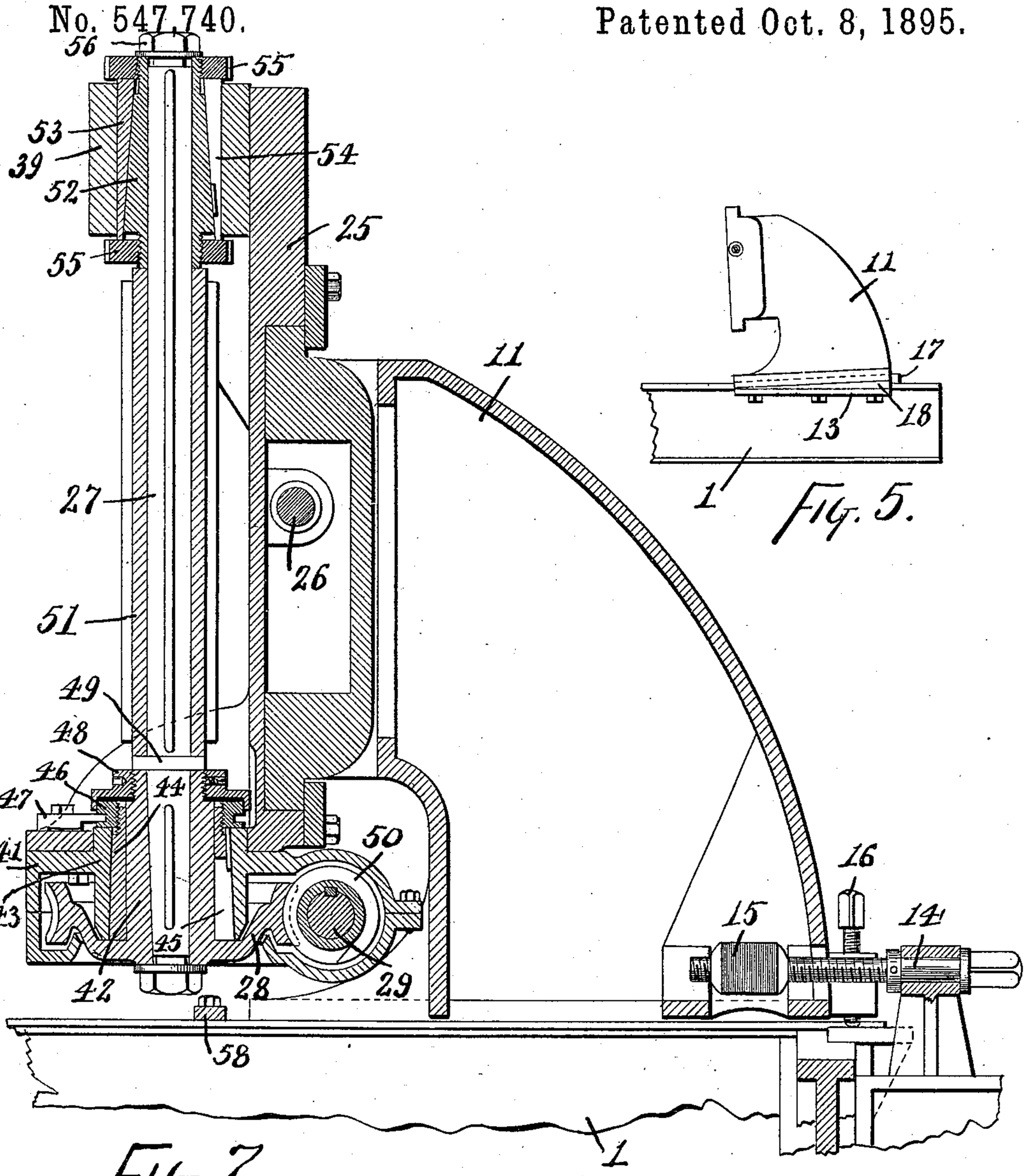

Fig. 7.

Fig. 5.

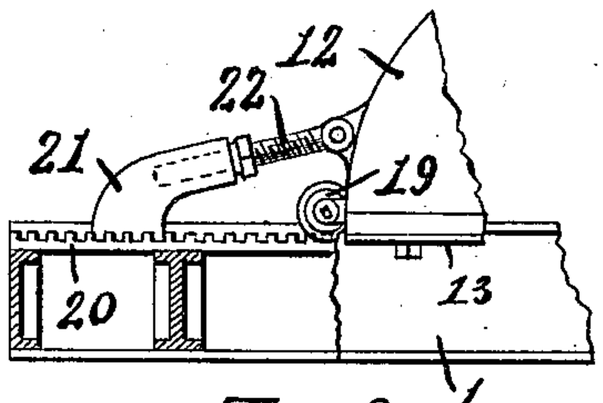

Fig. 6.

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UNITED STATES PATENT OFFICE.

GEORGE T. REISS AND JOHN B. CROCKER, OF HAMILTON, OHIO, ASSIGNORS TO THE NILES TOOL WORKS COMPANY, OF SAME PLACE.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 547,740, dated October 8, 1895.

Application filed March 21, 1895. Serial No. 542,633. (No model.)

To all whom it may concern:

Be it known that we, GEORGE T. REISS and JOHN B. CROCKER, of Hamilton, Butler county, Ohio, have invented certain new and useful Improvements in Milling-Machines, of which the following is a specification.

This invention pertains to a machine designed for milling the ends of columns, girders, and similar pieces, the ends being milled either square or beveling, the beveling of the lower ends of columns being sometimes required in order that the column may seat properly upon sill-courses having sloping surfaces.

Our improvements will be readily understood from the following description, taken in connection with the accompanying drawings, in which—

Figure 1 is a front elevation of a milling-machine exemplifying our invention; Fig. 2, a rear elevation of the right-hand portion of the same; Fig. 3, a vertical transverse section of the machine, showing the left-hand face of the right-hand milling-head as it appears in Fig. 1 and the right-hand face of the milling-head appearing in Fig. 2; Fig. 4, a vertical transverse section of the machine through one of the clamp-rests; Fig. 5, a front elevation of the right-hand milling-head of Fig. 1, showing the milling-head adjusted for beveled work; Fig. 6, a side elevation, part vertical longitudinal section, of the left-hand portion of parts shown in Fig. 1; and Fig. 7, a vertical longitudinal section of the machine centrally through the right-hand milling-head of Fig. 1.

In the drawings, 1 indicates a horizontal bed; 2, a pair of clamp-rests arranged to slide longitudinally thereon to support the piece whose ends are to be milled, there being two of these clamp-rests of identical construction, so that the description of one will answer for both; 3, the saddle of one of the clamp-rests gibbed to the bed; 4, a bracket with its foot gibbed to the saddle and arranged to slide in and out thereon, there being two of these brackets on each saddle, one to the front and the other to the rear of the longitudinal center of the machine; 5, a saddle gibbed to the vertical inner face of bracket 4 and arranged to slide up and down thereon; 6, a rest-lug projecting inwardly from the inner face of saddle 5; 7, adjusting-screw mounted in bracket 4 for vertically adjusting saddle 5; 8, a cross-screw mounted in rest-saddle 3 and engaging both of the brackets 4, which are mounted on that saddle, the screw being right and left handed, so that the turning of the screw will cause the two brackets to move equal to or from each other; 9, a bearing carried by saddle 3 and engaging the central portion of screw 8, and 10 a pinion-shaft mounted on saddle 3, its pinion engaging a rack 20, secured to the bed.

Pinion-shafts 10 are operated to move the rest-saddles to such position along the bed as is best suited to the length of the piece whose ends are to be milled. Screws 8 are then operated to adjust the brackets such distance apart as is suited to the reception of the piece to be milled. Screws 7 are then operated to bring lugs 6 to such level as to support the piece of work parallel with the bed and at desired height. Screws 8 are then operated to bring brackets 4 forcibly toward each other, thus firmly clamping the supported piece in proper position for the operation of the milling-heads upon its ends. The milling is done by vertically-disposed cylindrical cutters carried in milling-heads and arranged to feed the cutters across the ends of the job.

Proceeding with the drawings, 11 indicates the right-hand milling-head in the form of a strong bracket gibbed to the bed and presenting a horizontal cross-rail toward the clamp-rests; 12, a similar milling-head at the left of the clamp-rests, the two milling-heads being the same except in respects hereinafter indicated, it being understood, however, that the left-hand head 12 is a shifting head to be moved along the bed to suit the length of the work in hand, while the right-hand head 11 is virtually fixed, having only such shifting motion upon the bed as is incident to the depth of cutting; 13, gibbed clamps on the milling-heads engaging under the flanges of the bed, these clamps being tightened sufficiently to hold the heads with proper firmness to the bed and at the same time permit of their proper adjustments upon the bed; 14, adjusting-screw journaled in the bed at the right-hand milling-head and designed for giving a limited sliding motion to that head along the

bed; 15, Fig. 7, the nut of this screw, engaging in jaws in the milling-head, these jaws allowing the milling-head to rise and fall somewhat at the nut without disturbing the nut; 16, vertical adjusting-screws through lugs at the extreme right of milling-head 11 and impinging on the bed or fixed attachments thereon, so that by turning the screws the extreme right of the milling-head may be somewhat elevated, thus tipping the milling-head to the left at its top, the gibs 13 of that milling-head having, of course, been loosened to permit such tipping; 17, Fig. 5, wedges inserted under the tipped milling-head and over the bed to give the milling-head a solid support upon the bed in its tipped position; 18, wedges inserted in the opened joint at gibs 13 when the milling-head is tipped; 19, Fig. 6, a pinion-shaft mounted on the left-hand milling-head 12, its pinion engaging the longitudinal rack of the bed; 20, the longitudinal rack on the bed, engaged by the pinion just referred to and by the shifting-pinions of the rest-saddles; 21, a heel-block to the left of milling-head 12, its foot being toothed and resting in the teeth of rack 20, and 22 an adjusting-screw engaging between the left-hand milling-head and the heel-block 21, this screw being pivoted to the milling-head and having a nut abutting against the heel-block.

The piece of work having been clamped in the clamp-rests, as before described, with its right-hand end in fair working position with reference to the right-hand milling-head, pinion 19 is operated to adjust the left-hand milling-head up to proper relationship to the left-hand end of the work, after which heel-block 21 is dropped into engagement with the rack and the nut of screw 22 operated to give to the left-hand milling-head such delicate adjustment toward the piece of work as the operation of the milling-cutter may require. Screw 14 is operated to give the proper cutting adjustment to the right-hand milling-head, stop-bar 58 upon the bed limiting such adjustment within the capacity of screw 14. Normally both milling-heads set square upon the bed and support their milling-cutters vertically and mill the two ends of the work parallel with each other. If one end of the work is to be milled at a bevel, then gibs 13 of the right-hand milling-head are loosened and screws 16 employed in tipping that milling-head to bring the milling-cutter to the desired angle. End beveling will often be done to standard angles, and in such cases wedges 17 and 18 of proper taper may be employed in securing the proper tipping of the right-hand milling-head and securing firm clamping and the relieving of screws 16.

Referring further to the drawings, 23 indicates a splined shaft disposed alongside the bed; 24, a driving-pulley stepped for speed changing connected with shaft 23, by bevel-gearing in the example, whereby the general machine is disposable at right angles to the shop-shaft which drives the machine, it being understood, of course, that if this right-angle disposition is not desired the driving-pulley may be directly upon the shaft; 25, a saddle arranged to slide upon the rail of each milling-head, and here it may be stated that the two milling-heads being alike their accessories may be described in the singular number; 26, a feed-screw mounted in the rail to traverse the saddle along the same; 27, a milling-arbor disposed vertically and mounted in bearings on the sliding saddle, one at the upper and one at the lower end of the arbor; 28, Fig. 7, a worm-wheel fast on the lower end of the arbor; 29, a splined shaft supported by the rail of the milling-head below it and carrying a worm 50, engaging the worm-wheel; 30, bevel-gearing connecting the front end of this worm-shaft with a short shaft disposed at the front of the milling-head; 31, spur-gearing connecting this short shaft with shaft 23, the arrangement being obviously such that shaft 23 will thus transmit motion to the two worm-shafts, attention being called to the fact that gearing 31, as regards the right-hand milling-head, is made of sufficient face to permit that milling-head to have its limited sliding motion upon the bed without disengaging the gears, the lower gear of the pair at the right-hand milling-head being fast upon shaft 23, while, as regards the left-hand milling-head, the lower gear of the pair slides with the milling-head throughout its motion upon the bearing, being carried in a bracket 57, attached to the milling-head; 32, a bracket forming the bearing for the short shaft of milling-head 11, this bracket being bolted to the milling-head by bolts in segmental slots centering at shaft 29; 33, a worm-wheel fast on the rear end of rail-screw 26; 34, Fig. 2, a worm-shaft whose worm engages below this worm-wheel; 35, the bearing for this worm-wheel supported in proper position at the end of the rail; 36, a horizontal pivot forming the support at one end of bearing-piece 35; 37, a hand-cam supported by the rail and engaging under the free end of worm-bearing 35 and holding the worm normally into engagement with its worm-wheel 33, and 38, a short shaft supported in a bearing at the end of the rail below the worm-shaft 34, having one end spur-geared to the worm-shaft and having the other end bevel-geared to cross-shaft 29.

The turning of long shaft 23 gives motion to the arbors and also to the feed-worms 34, and through them to the feed-screws 26, whereby the arbors are turned and their saddles fed along the rails. By turning hand-cams 37 the worms 34 are dropped out of engagement with their worm-wheels and the feeding of the saddles is arrested. As the left-hand milling-head is shifted to various positions upon the bed, the transmitting-gears 31 move along with the head. As the right-hand milling-head is given its short adjustments along the bed for depth of cut, the mo-

tion is accommodated by the gearing 31 pertaining to that head, one of the gears sliding with reference to the other. When this right-hand milling-head is tipped to do beveled milling its gearing 31 would become disturbed, and the disturbance may be compensated for by lowering the bearing 32. The peculiar mounting of the milling-arbors in their saddles will now be described, Fig. 7 being preferably referred to.

39 indicates the top bearing of the milling-arbor, the same being bolted against the face of the top of the saddle; 40, Fig. 3, the bolts securing this bearing to the saddle, the same engaging the saddle by vertical slots in the saddle whereby the bearing may have vertical adjustment upon the saddle, the design being that the bearing is to be left free enough to adjust itself upon the saddle; 41, a casing for the worm and worm-wheel secured to the base of the saddle and formed in two horizontal parts, the upper part being bolted to the saddle and the lower part being bolted to the upper part, whereby the lower part may be removed, thus opening the worm-wheel casing, the casing forming a projection for the worm and worm-wheel and also a reservoir for oil; 42, the hub of the worm-wheel 28, the worm-wheel being fast upon the milling-arbor 27, the exterior of this hub therefore forming the lower journal of the milling-arbor; 43, the upper hub of the worm-wheel casing surrounding the hub of the worm-wheel and forming the lower bearing for the milling-arbor, this being bored tapering, larger below; 44, a bushing fitting the taper-bearing 43 and the journal formed by the hub 42, the upper end of this bushing projecting above bearing 43 and being threaded; 45, a saw-cut or split in one side of bushing 44 and extending from its lower end to near its top, whereby when the bushing is drawn upwardly in the bearing it becomes contracted upon the journal 42; 46, a nut screwed upon the upper end of the bushing and serving as a means for adjusting the bushing vertically in the bearing, this nut being preferably grooved; 47, a clamp bolted to the saddle and engaging the groove of nut 46, this clamp when tightened serving to prevent the turning of the nut or any lifting of the nut; 48, a nut screwed on the upper end of journal 42 and forming the adjustable upper collar for that journal, the washer being preferably inserted between this nut 48 and the nut 46; 49, a collar on the milling-arbor 27 just over its lower journal, this collar being the fast-clamping collar for the milling-cutter; 50, the worm heretofore referred to as giving motion to the worm-wheel and milling-arbor; 51, the milling-cutter fitted upon the arbor and having its peripheral teeth of any usual or desired form, the lower end of this cutter resting against collar 49 of the arbor; 52, a cone splined upon the milling-arbor over the upper end of the cutter and bearing against the upper end of the cutter; 53, a bushing having a tapered interior fitting cone 52, its exterior fitting the upper bearing 39 of the arbor, this bushing turning with the arbor and cone and forming the upper journal of the arbor; 54, a slot through one side of bushing 53, thus permitting the bushing to expand or contract as it is adjusted up or down upon the cone; 55, nuts upon the ends of cone 52, engaging above and below the bushing 53 and serving as means by which the bushing may be adjusted up or down on the cone and the bushing thereby expanded to a proper running feed in bearing 39, bearing 39 having such length that the nuts 55 will never clamp that bearing endwise; 56, a nut on the upper end of the milling-arbor 27, serving to firmly clamp the milling-cutter and the cone to the arbor; 57, Fig. 1, the bracket heretofore referred to as pertaining to gearing 31 of the left-hand milling-head, and 58, Fig. 7, the stop heretofore referred to as limiting the inward adjustment of the right-hand milling-head upon the bed of the machine.

Referring to Fig. 7, it will be observed that the milling-arbor is confined endwise by its lower journal only, the upper journal, formed by the bush 53, being free endwise in bearing 39, and bearing 39 being so loosely clamped to the saddle that it is at liberty to shift vertically. Expansion and contraction of the arbor are thus compensated for. The lower bearing, formed by bushing 44, may be tightened upon the lower journal 42 by means of nut 46. End play at the lower journal may be taken up by means of nut 48. The upper journal, formed by bushing 53, may be expanded in its bearing 39 by means of the nuts 55. The milling-cutter is clamped to the arbor by nut 56. By removing nut 56 and, if necessary, further slacking bolts 40, Fig. 3, the upper bearing 39, together with cone 52 and bushing 53, may be removed, and then the milling-cutter may be lifted off of the arbor and another put in place.

We claim as our invention—

1. In a milling machine, the combination, substantially as set forth, of a horizontal bed, a milling head mounted upon the bed near one end, a saddle mounted on the head and arranged to slide crosswise of the bed, a vertical milling arbor mounted in said saddle, a second similarly provided milling head arranged to shift along upon the bed, and a pair of shifting clamp-rests secured to the bed between the two milling heads.

2. In a milling machine, the combination, substantially as set forth, of a horizontal bed, a pair of milling heads mounted thereon, saddles sliding on the heads crosswise of the bed and carrying vertical milling arbors, a pair of shifting clamp-rests mounted upon the bed between the two milling heads, and means for tipping one of said milling heads to bring the plane of its milling arbor at an angle to the vertical plane of the other milling arbor.

3. In a milling machine, the combination, substantially as set forth, of a horizontal bed,

milling heads thereon, rest-saddles arranged to slide upon the bed between the milling heads, brackets arranged to slide upon said saddles crosswise of the bed, saddles arranged to slide vertically upon the inner faces of said brackets and having inwardly projecting rest-lugs, and screws for adjusting the brackets upon the rest-saddles and the lugged saddles upon the brackets.

4. In a milling machine, the combination, substantially as set forth, of a horizontal bed, a milling head mounted at one end thereof for limited sliding motion thereon and carrying a vertical milling arbor, an adjusting screw for moving said milling head upon the bed, a second milling head arranged to shift along the bed, and shifting clamp-rests mounted upon the bed between the two milling heads.

5. In a milling machine, the combination, substantially as set forth, of a horizontal bed, rest-clamps thereon, a milling head mounted on the bed, a saddle sliding thereon crosswise of the bed and carrying a vertical milling arbor, and adjusting screws arranged to tip said milling head upon the bed.

6. In a milling machine, the combination, substantially as set forth, of a horizontal bed having top flanges, clamp rests mounted on said bed, a milling head carrying a transversely movable vertical arbor and resting upon the top of said bed, clamps attached to said milling head and engaging under the flanges of the bed, and wedges interposed between said milling head and the top of the bed.

7. In a milling machine, the combination, substantially as set forth, of a horizontal bed having top flanges, clamp rests mounted on said bed, a milling head carrying a transversely movable vertical arbor and resting upon the top of said bed, clamps attached to said milling head and engaging under the flanges of the bed, and wedges interposed in the joint between said milling head and clamps.

8. In a milling machine, the combination, substantially as set forth, of a horizontal bed provided with a longitudinal rack, rest-clamps mounted on said bed, a milling head carrying a vertical arbor and mounted for sliding motion on the bed, a pinion-shaft mounted on said milling head with its pinion engaging said rack, a heel-block engaging at selected position on said rack, and an adjusting screw engaging between said heel-block and milling-head.

9. In a milling machine, the combination, substantially as set forth, of a milling head having a horizontal rail, a saddle fitted to slide on said rail and carrying a worm-bearing, a splined shaft mounted parallel to said rail, a feed screw mounted on the rail to move the saddle thereon, a vertical milling arbor mounted in bearings carried by the saddle, a worm-wheel fast on said arbor, and a worm on said shaft at said worm-bearing and engaging said worm-wheel.

10. In a milling machine, the combination, substantially as set forth, of a milling arbor, a driving gear fast to one end of the milling arbor and having a hub forming a journal for the arbor, a tapered bearing surrounding such journal, a split bushing fitting such journal and tapered exteriorly to fit said bearing, a nut for adjusting the bushing endwise in the bearing, and a supporting bearing at the opposite end of said arbor.

11. In a milling machine, the combination, substantially as set forth, of a milling arbor, a tapered bearing at one end thereof, a split bushing fitting the journal of the arbor and tapered exteriorly to fit said bearing, a nut upon one end of said bushing and engaging one end of said bearing, and a nut upon the arbor engaging against the face of said bushing-nut.

12. In a milling machine, the combination, substantially as set forth, of an arbor having at one end a journal and a clamping collar at the inner end of the journal, a sliding journal at the other end of the arbor, a nut on the second end of the arbor to move said sliding journal and clamp a cutter between said sliding journal and said collar, a rigid bearing for the first mentioned journal, and an endwise sliding bearing for said sliding journal.

13. In a milling machine, the combination, substantially as set forth, of a milling arbor, a cone removably secured to one end thereof, a split bushing fitting upon and turning with said cone, nuts upon said cone clamping endwise upon said bushing, a bearing engaging the exterior of said bushing, and a supporting bearing for the opposite end of said arbor.

14. In a milling machine, the combination, substantially as set forth, of a splined milling arbor having a fixed collar near one end, an enlarged journal splined upon the opposite end of the arbor, a bearing for such enlarged journal, a bearing for the opposite end of the arbor, a milling cutter splined upon the arbor between said collar and said enlarged journal, and a nut upon the arbor for clamping said cutter and enlarged journal against said collar.

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