E. H. LICHTENBERG.

BAR BENDER.

APPLICATION FILED OCT. 18, 1916.

1,264,097.

Patented Apr. 23, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

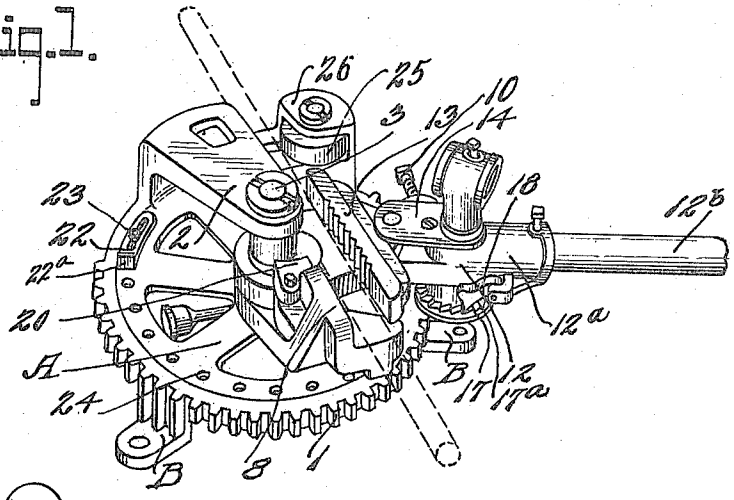


Fig. 2.

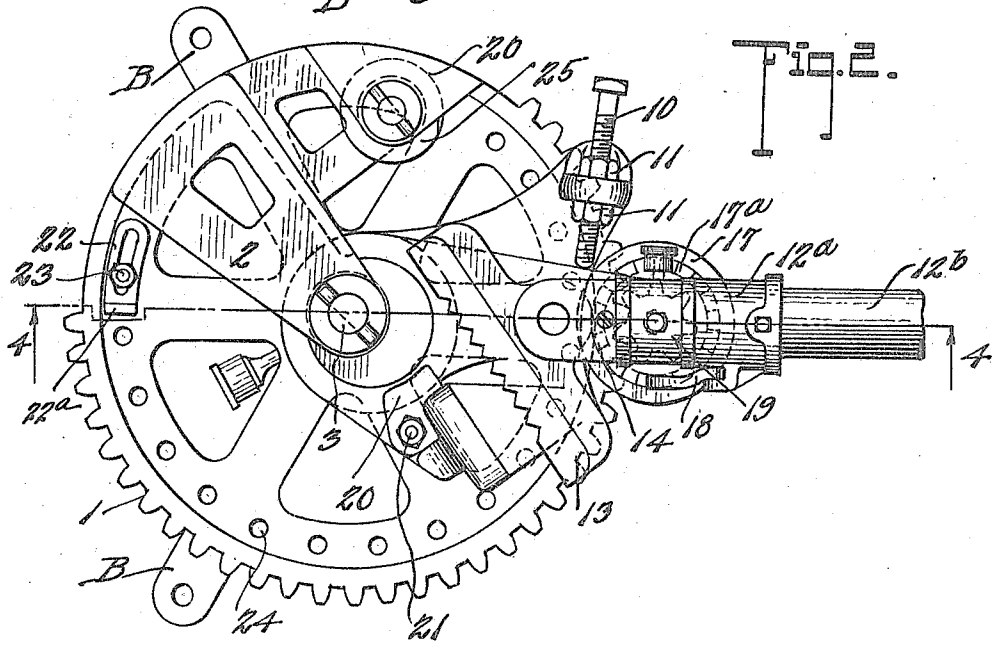
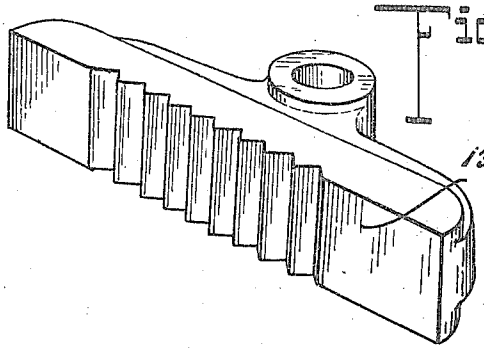


Fig. 3.



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2 SHEETS—SHEET 2.

Fig. 4.

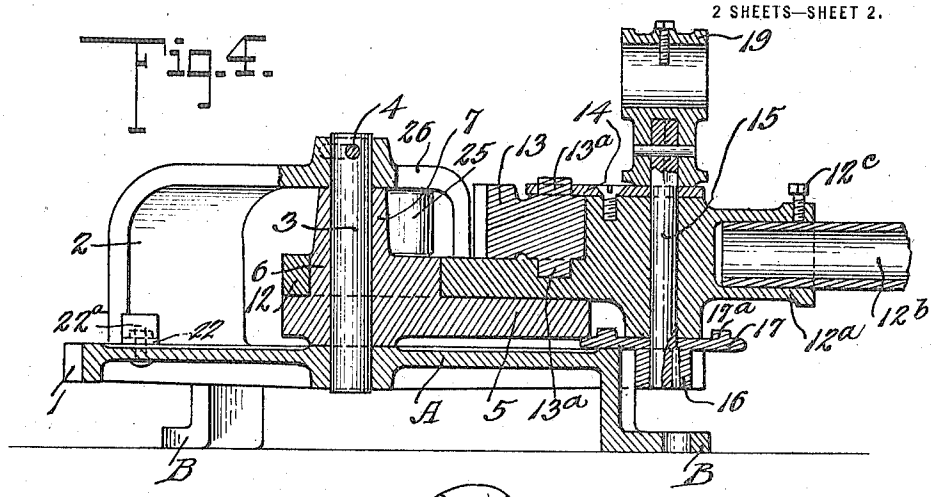


Fig. 5.

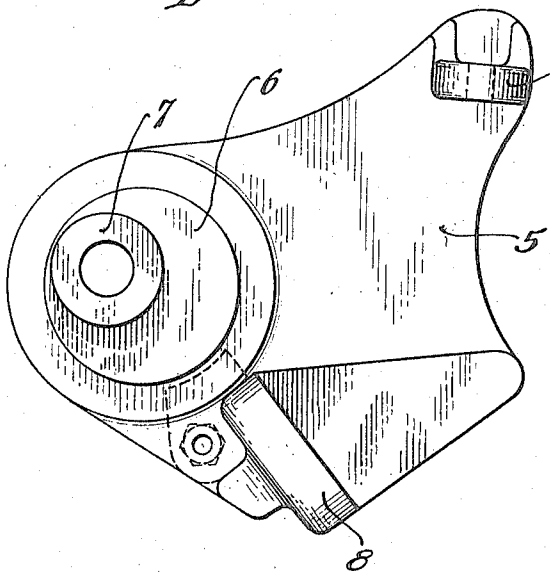
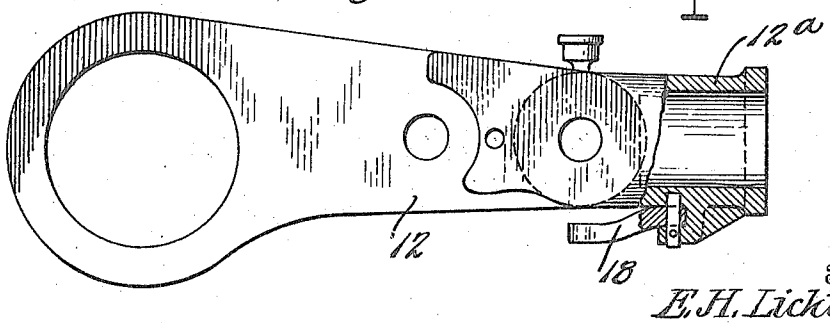


Fig. 6.



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BAR-BENDER.

1,264,097. Specification of Letters Patent. Patented Apr. 23, 1918.

Application filed October 18, 1916. Serial No. 126,306.

To all whom it may concern:

Be it known that I, ERICH H. LICHTENBERG, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Bar-Benders, of which the following is a specification.

This invention comprises a bar bending tool of novel construction.

Tools of the class of the present invention are designed particularly for bending rods or bars of different thicknesses, provision being ordinarily made also whereby portions of a rod or bar operated upon by the tool may be bent at different angles as required for special purposes for which the bent part is to be used.

This invention has a number of different objects, the primary ones of which are the construction of a machine of the class referred to which affords a maximum amount of leverage power for bar bending purposes while at the same time the construction is not unduly complicated; the employment of means for clamping or gripping the rod or bar to be bent, which means is susceptible of ready adjustment to accommodate bendable parts of different diameters; the utilization of operating means so designed that bendable members of smaller diameters may be bent by direct leverage action of the operating means thereupon, whereas in respect to heavier and more resistant bendable members the operating means is susceptible of different actuation incident to employment of the powerful moving effect of meshing gear elements to render the bending of said members comparatively easy on the part of the operator or operators of the machine; the provision of peculiarly acting locking means coöperative with the main operating means by which the bar is to be bent and which locking means avoids liability of springing back of the bent bar member at any period of the bending operation and when said operation is completed.

In addition to the foregoing main and essential features of the present bending tool or machine, it is contemplated to employ a number of novel features of construction including special adjustable gage means for facilitating the bending of bars or rods at different angles as required, together with novel detail formations of certain operating parts designed with a view to reducing friction, conducing to the simplicity of the general construction of the machine and the like, all of which features are desirable and increase the advantages of the use of the machine from a practical viewpoint.

In the accompanying drawings which may be consulted in connection with the following detail description for a full comprehension of the construction and operation of this bar bending machine—

Figure 1 is a perspective view of the invention showing the operating lever in position ready to be actuated and the movable jaws so disposed as to be ready to receive the bar to be bent, the latter being shown in dotted lines;

Fig. 2 is a top plan view of the same;

Fig. 3 is a detail perspective view of the serrated jaw;

Fig. 4 is a sectional view on the line 4—4 of Fig. 2 showing more clearly the method of assembling the parts of the machine;

Fig. 5 is a detail perspective view of the main jaw member; and

Fig. 6 is a plan view partly in section showing the main operating lever with its handle omitted.

Specifically describing the invention, as is customary the bending machine comprises a base A, said base, however, being formed in accordance with this invention with a somewhat round body and the periphery of said body being toothed as shown at 1 and thus constituting practically speaking a gear element the teeth of which are interrupted at a certain portion of the base. The base A is supported by several feet B adapted to be bolted or otherwise fastened to a suitable support. Formed integrally with the base A is an overhanging bracket 2 supplied with a bearing coinciding with a bearing at the center of the base, and which bearings receive the axis or pivot 3 made in the form of a pin and supported from displacement by a cross pin 4 passing transversely therethrough at its upper end, the ends of the cross pin 4 being seated in notches in a boss formed on the bracket 2.

Mounted on the pivot 3 is a main jaw member 5 of peculiar formation, the body of said member being provided with an opening through which the pivot passes and having on its upper side the eccentric member 6 and the concentric portion 7, the parts

5, 6 and 7 being integral and the part 7 constituting a bending die about which the bar or rod operated upon by the machine is adapted to be bent and which therefore controls the curvature of the bent portion of the bendable member whatever it may be. The eccentric member 6 is located proximate to and in fact may be said to partially surround the concentric portion 7. Owing to the proximity between the parts 6 and 7 the member 6 will be seen to have a sort of camming action in relation to the jaw 5, all of which will appear fully upon a later understanding of the operation of the machine. At the outer portion thereof the jaw member 5 is formed with a jaw 8, said jaw also being of integral formation preferably. On its outermost portion the jaw member 5 is formed with an apertured lug 9 through which passes an adjustable stop screw 10 having thereon jam nuts 11 at opposite sides of the lug 9 whereby the screw when adjusted may be held from accidental movement. There is also mounted upon the pivot 3 the lever 12, said lever being supported indirectly on the pivot, however, by means of the eccentric member 6 of the jaw member 5. In other words, the lever 12 has a boring or opening receiving, and therefore fitting over, the eccentric member 6, so that while the lever 12 is supported by the axis or pivot 3 it is really eccentrically mounted on said axis, and the reason for such mounting will appear more fully hereinafter.

The lever 12 comprises a socket 12^a adapted to receive a handle 12^b to be secured thereto by a set screw 12^c, and said handle may be a length of steel pipe or the like as desired. Supported on the lever 12 is the serrated or lever jaw 13 which jaw is preferably formed with trunnions 13^a, the lower one of which is supported in a recess in the lever 12 and the upper one of which is received by an opening in a plate 14 secured to the upper side of said lever, see Fig. 4.

Intermediate its ends the lever 12 is provided with a shaft 15 which passes vertically therethrough, the lower end of said shaft having a spur gear 16 keyed thereto, which spur gear meshes with the teeth 1 on the base A. The spur gear 16 is formed with a flange 17 having ratchet teeth 17^a on its upper side, see Figs. 1 and 4, and there is provided on the socket portion 12^a of the lever a pivoted pawl 18 adapted to engage the ratchet teeth 17^a aforesaid. The upper end of the shaft 15 projects above the lever 12 and has pinned thereto to rotate therewith the lower portion of a socket member 19, which socket member 19 is adapted to receive the handle 12^b of the lever 12 when said handle is detached from the socket 12^a, or to receive a handle of equivalent diameter adapted to pass through the socket 19 so that its ends project in opposite directions from the socket and may be grasped by workmen for the purpose of turning said handle.

It is to be noted that at one side the lever 12 is adapted to abut with an adjacent end of the stop screw 10 and relative movement of the jaw 13 away from the jaw 8 is thus limited and may be varied according to the adjustment of the screw 10, whereby the jaws 8 and 13 may readily receive bars or rods of different sizes therebetween, with a minimum of looseness. On the jaw member 5 adjacent to the jaw 8 is located a bracket 20, seen best in Figs. 1 and 2, which bracket is secured to the member 5 by a screw 21. The purpose of the bracket 20 which overlaps the inner end of the lever 12 is to prevent any liability of this end of the lever being lifted off of the eccentric member 6.

Seated adjacent to the overhanging bracket 20, according to the illustration in the drawings, is the gage plate 22 which is slotted and held in place by a suitable bolt 23. The bolt 23 is adapted to pass through any selected one of a series of openings 24 provided in the body A adjacent to the teeth 1 of the latter and it will be readily apparent that by merely adjusting said plate 22 so that its end lug 22^a is located at different distances from the nearest portion of the jaw member 5 the degree of bending of the bar or rod operated upon by the machine may be correspondingly varied. In other words, the lug 22^a of the gage plate 22 is adapted to abut with the jaw member 5 whereby to regulate or limit the extent of bending movement of said jaw and the lever 12 with its coöperating jaw 13.

The foregoing sets forth the detail construction of a machine embodying the improvements of the present invention and the operation of said machine is substantially as follows. A bar or rod to be bent is placed on the machine between the jaw 8, the jaw 13, the bracket 2 and a roller bearing 25 journaled on a small extension 26 of the base A. If the bendable member is of relatively small diameter the handle 12^b in the socket 12^a will be actuated and as a result the said handle will initially carry the serrated jaw 13 into clamping impinging engagement with the bendable part, the relative mounting of the parts 13 and handle or jaw 8 permitting the foregoing action. In the above operation the movement of the arm 13 and lever 12 is independent of any movement of the jaw member 5 and its jaw 8 but when the clamping action of the bendable part between the jaws 13 and 8 has been effected a further movement of the lever 12 by the handle 12^b will cause simultaneous turning or rotating movement of the jaws

13 and 8 together, bending the bendable part around the base or die 7 previously described. The bending movement of the parts as set forth above is limited by coöperation of the gage plate 22 with the jaw member 5. It is owing to the eccentricity of the mounting of the lever 12 that the preliminary clamping movement of the jaw member 13 against the work previous to bending, is obtainable, and also owing to the peculiar mode of connection of the parts 12 and 1 and 6, the greater the extent of movement of the lever 12 the greater becomes the leverage factor obtainable as an incident to its operation.

It will be observed that when the work is bent by direct operation of the lever 12 through its handle 12^b in the above manner the spur gear 16 rotates as it moves around the periphery of the base in mesh with the teeth 1 and the ratchet pawl 18 idles over the teeth 17^a of the gear 16 during bending movement of the lever 12, but instantly locks the lever 12 against any return movement that might be incident to the tendency of the part being bent to spring back. It is necessary to lift the pawl 18 therefore in order to release the work when bent and in order to restore the lever 12 to its initial or normal position ready to receive the work.

When the work to be done consists of bending heavy bars, such as bars of upward of one to one and one-half inches the power required for operating the bending devices of this invention is such that it is preferred to employ the shaft 15 as an actuator, under which conditions the handle 12^b may be removed from the socket 12^a and passed through the socket member 19, whereupon the shaft 15 may be rotated readily causing a corresponding rotation of the gear 16 which gear then constitutes a powerful actuating part coöperative with the teeth 1 of the base whereby to turn the jaw member 5 and the lever 12 in effecting the bending operation. Of course during such actuation of the shaft 15 the locking pawl 18 is adapted to coöperate with the teeth 17^a of the spur gear 16 to perform the locking function hereinbefore ascribed to this part.

Having thus described my invention, what is claimed as new is:—

1. In a bar bending machine, the combination of a base, an operating lever mounted thereon, bending devices adapted to be actuated by said lever, a shaft on the lever, gear elements between the base and the shaft, a handle member adapted to be connected with the shaft for operating the same to cause operation of the lever through driving of said gear elements, said handle member being adapted to be connected with the lever for direct operation of the same without driving action of the lever by said gear elements.

2. In a bar bending machine, the combination of a base, an operating lever mounted thereon, bending devices adapted to be actuated by said lever, a shaft on the lever, gear elements between the base and the shaft, a handle member adapted to be connected with the shaft for operating the same to cause operation of the lever through driving of said gear elements, said handle member being adapted to be connected with the lever for direct operation of the same without driving action of the lever by said gear elements, and pawl and ratchet means for preventing unauthorized reverse movement of said gear elements.

3. In a bar bending machine the combination of a base comprising a gear element and having an abutment forming a bearing for a bar to be bent, a bending device mounted on said base, means for actuating said bending device comprising a driving gear coöperative with the gear element of the base, and a pawl and ratchet locking device between the bending device and said driving gear for preventing unauthorized movement thereof in a direction permitting movement of the bending device reverse to its bending movement.

4. In a bar bending machine, the combination of a base, bar bending means thereon including a lever, means intermediate said lever and the base for effecting positive movement of the lever for bending purposes, and means to actuate the lever through the last mentioned means, or to actuate the lever directly.

5. In a bar bending machine, the combination of a base, bar bending means thereon including a lever, means intermediate said lever and the base for effecting positive movement of the lever for bending purposes comprising a shaft, and gearing intermediate said shaft and the base, and means adapted to be interchangeably applied to the said shaft and to the said lever whereby to operate the lever and the bending means through the actuation of the shaft, and to operate the lever through direct movement of the latter without said driving action from said shaft.

6. In a bar bending machine, the combination of a base, and bending instrumentalities thereon including a main jaw pivoted to said base and formed at its pivoted portion with an eccentric camming member, a complemental jaw member comprising a portion receiving said eccentric member to turn about the latter as an axis, and means for operating the jaws connected with the complemental jaw for initial movement of the same to clamp the work against the main jaw and thereby and thereafter to cause movement of the main jaw with the complemental jaw.

7. In a bar bending machine, the combination with a base, a main jaw member pivoted to said base and having an eccentric cam member thereon movable therewith and par-

tially surrounding its pivotal axis, a lever having a portion receiving said eccentric member so that the latter forms the axis for said lever, and a complemental jaw member carried by said lever and coöperative with the main jaw member.

8. In a bar bending machine, the combination of a base, an abutment thereon for engagement with a part to be bent, bending mechanism on the base comprising a pivoted main jaw and a coöperative clamping jaw supported eccentrically with respect to said main jaw, means for operating said clamping jaw to clamp the work against the main jaw and for then effecting simultaneous movement of the jaws for bending the work, said last mentioned means including a lever connected with the clamping jaw, and gearing intermediate said lever and the base for effecting positive actuation of the jaw members.

9. In a bar bending machine, the combination of a base, an abutment thereon to engage work to be bent, separate jaws mounted on said base, a pivot forming a common axis for said jaws, one of the jaws being a clamping jaw and the other jaw having an eccentric cam member extending from the pivot and about which said clamping jaw is movable as an axis, and means to initially actuate the clamping jaw to cause it to clamp the work between it and the other jaw and to then move the jaws simultaneously for bending the work.

10. In a bar bending machine, the combination of a base and bending instrumentalities thereon including a main jaw pivoted to said base, a complemental jaw pivoted to the main jaw eccentrically of the axis of the latter, and means for operating the jaws connected with the complemental jaw for initial movement of the same to clamp the work against the main jaw and for subsequent movement of the same to cause simultaneous movement of the jaws for bending the work, the pivotal connection intermediate the complemental jaw and the main jaw comprising a lever, a handle for moving said lever, the base being formed with a gear element, and a gear device on the lever coöperative with said gear element for actuating the lever and the complemental jaw.

11. In a bar bending machine, the combination of a base, a central pivot on said base, a jaw member carried by said pivot and having a main jaw thereon, an abutment on the base adapted to engage the work, a lever pivotally connected with said jaw member eccentrically in relation to the pivot of the latter, a complemental jaw on said lever coöperative with the main jaw for initial movement to clamp the work against the main jaw and to subsequently coöperate with the main jaw by movement therewith to bend the work, means for actuating said lever, and means to variably limit the relative movement of the lever and its complemental jaw in respect to the main jaw, and including an adjustable stop carried by said jaw member and between which and the main jaw the lever is adapted to operate.

In testimony whereof I affix my signature.

ERICH H. LICHTENBERG.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."