Aug. 3, 1943. M. V. BERLICHINGEN ET AL 2,325,827

METAL WORKING MACHINE

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FIG. 1.

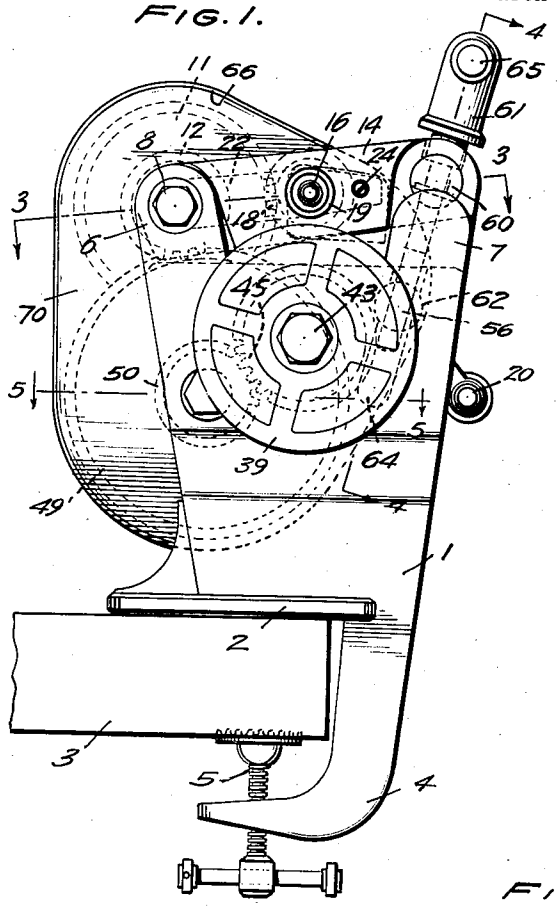


FIG. 2.

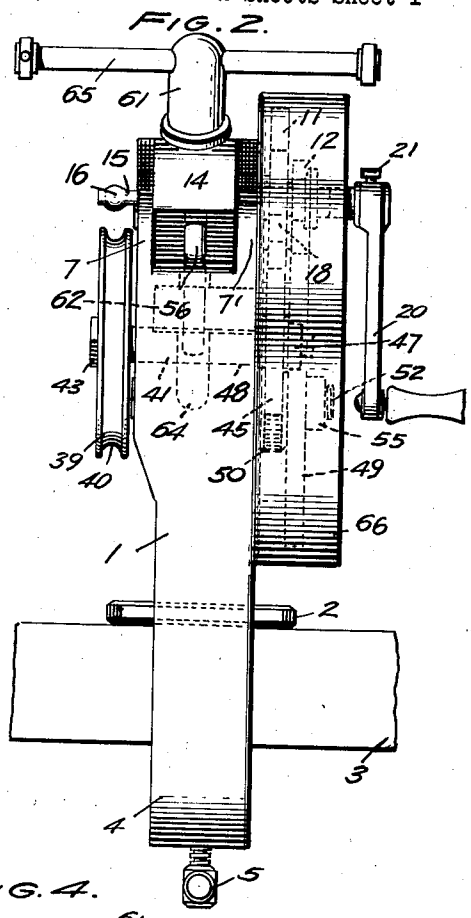


FIG. 4.

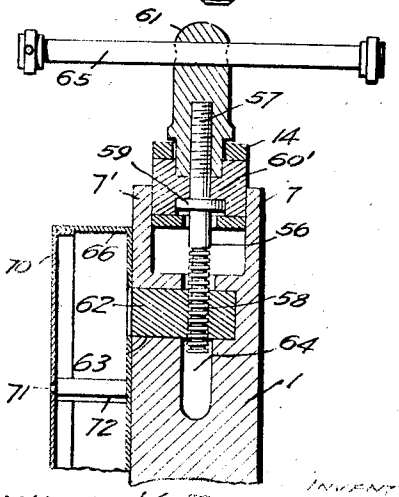
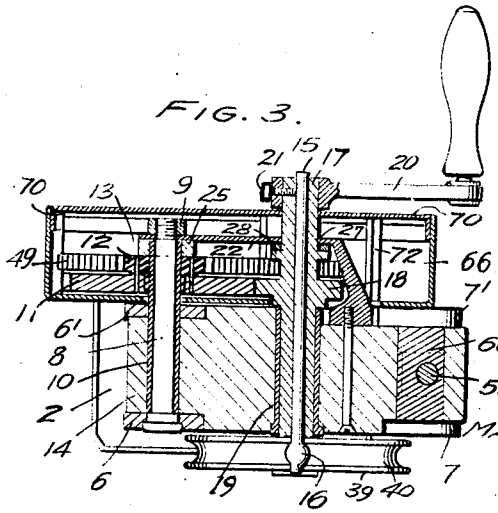


FIG. 3.



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METAL WORKING MACHINE

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FIG. 6.

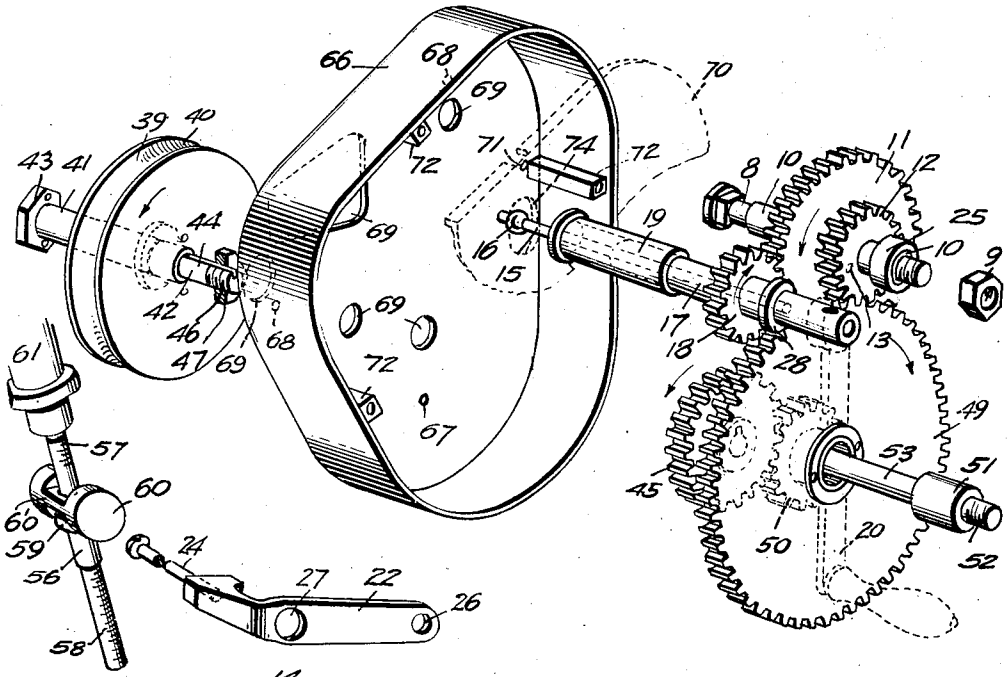


FIG. 7.

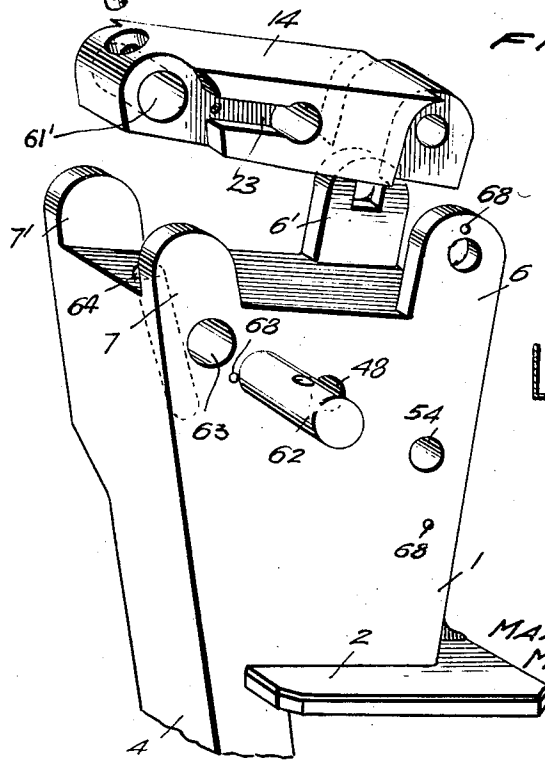
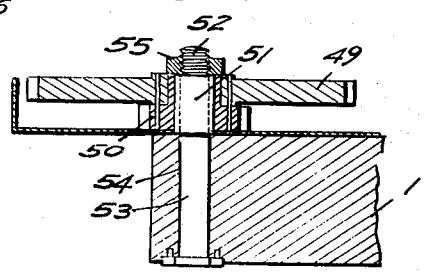


FIG. 5.



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Patented Aug. 3, 1943 2,325,827

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2,325,827

METALWORKING MACHINE

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Application March 23, 1942, Serial No. 435,892

17 Claims. (Cl. 153—9)

This invention relates to improvements in metal working machines and particularly to machines designed for beading, edging, turning, and otherwise deforming or processing sheet metal and tubing.

The primary object of the invention is to provide a beading and forming machine of generally improved construction and novel design productive of maximum efficiency and accuracy in processing the work and adapted to be usable over a considerable period of time.

Another object of the invention is to provide a beading and forming machine especially adapted for beading and forming metal bands or collars on tubing used in aircraft and capable of forming a continuous bead or collar around either the outer or the inner surface of the tubing.

A further object is to provide a beading and forming machine in which the work-deforming units are adjustable to accommodate cold workable tubing of metal or other material of various thicknesses and diameters and for making collars and bands of various widths and depths.

A still further object is to provide a portable machine that requires no special skill or training to operate, is simple in construction, inexpensive to manufacture, and efficient in operation, use, and service.

The above objects and advantages are attained by the novel construction, combination, and arrangements of parts hereinafter more fully described and pointed out with reference to the accompanying drawings, wherein:

Figure 1 is a side view of the machine, the latter being shown clamped to a support.

Figure 2 is a front end view of the structure shown in Figure 1.

Figure 3 is a horizontal section on line 3—3 of Figure 1.

Figure 4 is a vertical section on line 4—4 of Figure 1.

Figure 5 is a horizontal section on line 5—5 of Figure 1.

Figure 6 is an exploded view of the work-deforming rolls and gears of the machine with their respective associated parts.

Figure 7 is an exploded view of the body and lever of the machine with their respective associated parts.

In a practical embodiment of the invention, the frame of the machine may be a solid body 1 substantially rectangular in cross section and having a base portion or flange 2 at one end for contacting the top of a table or work-bench 3 upon which the machine is to be supported. A bracket 4, formed as an integral part of the body and depending below and under the base 2, threadedly supports the screw 5 of a clamp-screw device by means of which the machine is securely attached to the table or other support. Portions of the side walls of the body adjacent the rear and forward edges of the latter are extended outwardly beyond the top face of the body to provide rearwardly and forwardly disposed pairs of lugs or ears; the lugs of the rearwardly disposed pair being indicated at 6 and 6' and the lugs of the forwardly disposed pair being indicated at 7 and 7'. Lugs 6 and 6' are suitably apertured to receive and support a gear axle or spindle comprising a headed axle-bolt 8 having a square shoulder at its headed end and a screw-threaded portion at its opposite end, a nut 9 on the screw threaded portion, and a bushing 10 encircling the shank of the bolt for the full distance between the nut and shoulder of the bolt. The length of the fulcrum is such that, when the head and shoulder of the bolt are seated in the correspondingly apertured lug 6, a substantial portion of the bolt and the bushing extends outwardly beyond the bearing aperture in lug 6' and the corresponding side wall of the body, as shown in Figure 3. Rotatable on the extended portion of the bushing 10 is a motion-receiving-and-transmitting element comprising relatively large and small gears 11 and 12; the larger gear being between the smaller gear and the adjacent side wall of the body and supported on an integral extension or hub of the smaller gear. Both gears are pinned together, as shown at 13 for unitary rotation.

Superimposed on the top face of the body and extending fore-and-aft thereof between the lugs is a lever 14. The portion of the lever disposed between lugs 6 and 6' has a transverse bearing opening through which extends the axle bolt 8 and bushing 10, the latter members thus constituting a pivot or fulcrum for the lever. The lever serves as a vehicle or carrier for one of two cooperating work-deforming units, the other of which is mounted on or carried by the body 1 as hereinafter described. The specific design of the work-deforming units varies in accordance with the character of the work to be performed. Thus, in forming continuous beads or collars on metal tubing it is customary to employ a forming roll having a continuous bead thereon and a cooperating roll grooved to match the beaded roll. In the machine here described and illustrated, the beading roll is carried by the lever

and the grooved roll is carried by the body. This order may, however, be reversed if so desired. For the purposes of the present invention, the beading roll comprises a long slender, comparatively fragile, rod 15 having a bead 16 adjacent one end, as illustrated. The beaded rod has a snug, sliding fit with the bore of a tube 17 extending around the rod from a point rearwardly adjacent the bead substantially to the far end of the rod. Tube 17 supports and reinforces the comparatively fragile beading roll. In addition to its function as a reinforcement for the beading roll the tubes 17 serves also as a gear-spindle and torque tube. To this end, it is provided with a small gear 18 which may be either an integral part of, or a separate member securely attached to, the tube at a suitable location thereon whereby in the assembled machine it meshes with the large gear 11 of the pivot assembly.

The lever 14 is apertured to receive a bushing 19 within which the journal portion of the tube 17 is supported and revolves about an axis parallel to the pivot or axis of the lever. The length of the tube is such that on the side of the gear-bearing portion opposite to the journal it extends considerable beyond the body to provide a mount for a crankhandle 20. The handle, tube and rod may be connected together for unitary rotation in any suitable manner but it is preferred that they be bound together by a set screw 21 screwed through the socket portion of the handle and through the tube into binding engagement with the rod, as shown in Figure 3. When the handle is turned to rotate the beading roll, the rotation is transmitted by the small gear 18 of the torque tube 17 to the large gear 11 at the pivot of the lever and in any adjustment of the lever about the pivot the smaller gear travels around the larger gear always in full and complete mesh therewith. The two gear-spindle assemblies are adequately supported at their respective gear-bearing portions by an angle-brace or arm 22 having its base seated in a slot 23 on the gear-side of the lever and opening inwardly of the free end of the latter to a point adjacent the bushing 19. A fastening member, such as a screw-bolt or machine screw 24, extends through the lever from the side opposite the slot and is threadedly engaged with the base of the arm. The arm is thus securely and removably attached to the lever and is so shaped as to extend angularly outwardly of the lever to a point slightly beyond the zone of gearing and then spanwise of the gearing with its terminal end disposed against a spacer 25 on the outer end of the pivot bushing 10. The terminal end of the arm is apertured as at 26, to permit extension therethrough of the screw-threaded end of the axle bolt 8 on which it pivots during adjustment of the lever and upon which it is retained by the nut 9. The arm is provided also with a bearing opening 27 for the torque-tube 17 and by reason of its abutment with a collar-and-washer unit 28 on the tube keeps the torque tube and its associated parts in proper operating position, i. e., the beading roller assembly is prevented from sliding out toward the gear-side of the body.

The body-mounted work-deforming unit comprises a relatively large wheel or roll 39 having a peripheral groove 40 matching the bead 16 of the beading roll. Grooved roll 39 is mounted on the journal 41 of an axle-bolt or spindle 42 to the head 43 of which it is rigidly fastened by pinning or otherwise. The part of the spindle beyond the journal is reduced slightly in diameter and has an inwardly disposed smooth surfaced section 44, upon which is supported a small gear 45, and an outwardly disposed screw-threaded section 46 upon which is screwed a threaded nut 47. The gear 45 is keyed or otherwise fixed on section 44. Spindle 42 is journaled in bearing opening 48 in the body with the grooved roll 39 correlated with the bead 16 of the beading roll so that both are rotatable in a common plane, the gear 45 being in the zone of gearing on the opposite side of the body but out of mesh with any of the previously described gears. The rotation of the handle-operated beading roll, transmitted by gear 18 to gears 11 and 12, is further transmitted to gear 45 through gears 49 and 50; the gear 49, which is the largest gear in this particular chain of gearing, meshing with gear 12 and the smaller gear 50 meshing with gear 45. Gears 49 and 50 revolve upon the bearing 51 adjacent the threaded end 52 of an axle bolt 53 supported in the transverse opening 54 of the body. As shown in Figure 5, the head of the bolt is pinned or otherwise attached to the side wall of the body to hold the bolt against turning while at the gear-end of the bolt the larger gear 49 is seated on the outwardly disposed hub of the smaller gear 50. Both gears are connected together, preferably by pins, for unitary rotation and are retained upon the bolt by means of the nut 55.

The various gears whereby the rotation of the beading roll is transmitted to the grooved roll are of such calculated size and combination as to cause both rolls to be positively rotated in opposite directions and at the same rate of speed as measured at their circumferences. Hence, in processing the work to be deformed, such as forming a continuous head or collar on a tube, the bead or collar which is put thereon is not scratched or marred as it very likely would be when both rollers fail to rotate at the same circumferential speed. Moreover, since the gears in mesh are always in full and complete mesh, the teeth of the gears, and therefore the machine itself, will have a longer life.

Adjustment of the lever about its pivot varies the spacing or distance between the bead and the groove of the respective work-deforming rolls and thus enables the machine to be used for processing tubing and other work of various thicknesses and diameters and in making collars and bands of various widths and depths. Suitable means for effecting desired adjustments of the lever comprises a sectional adjusting screw having a pivotal and swivel connection with the lever near the free end of the latter and threadedly engaged with a nut pivotally mounted on the body of the machine. The specific construction of the parts are shown to advantage in Figures 4 and 7 of the accompanying drawings. The body of the screw is a round metal rod 56 having screw threads on opposite end-portions 57 and 58 and a collar 59 between the threaded end-portions. End portion 57 extends through a transverse opening in the web 60' of a cylindrical pivot member 60 and is threadedly engaged by a head of knob 61 screwed down against one side of the web and holding the collar 59 against the opposite side thereof without preventing the turning of the screw about its longitudinal axis. The knob and screw rod are thus swiveled to the pivot member and the latter is supported in an opening 61' in the lever for rotation about an axis parallel to the pivot axis of the lever. The lever is apertured above and below the open-

ing 61' to accommodate the knob and depending screw-threaded portion 58 of the rod. The nut 62 is a cylindrical member rotatable in a recess 63 in the body about an axis parallel to the axis of the lever and it spans a cavity 64 intersecting the recess 63 in the plane of the screw rod and the threaded opening in the nut. The cavity is sufficient in width and depth to provide clearance for the screw-threaded portion 58 of the adjusting screw. To facilitate the turning of the screw, the knob thereof is provided with a cross handle 65. By reason of the pivotal mountings of the adjusting screw and nut, the raising and lowering of the lever is accomplished without bending or sticking and the screw adjustment enables fine settings of the lever to be obtained and maintained.

The gearing of the machine is enclosed within a detachably mounted gear housing comprising a flanged receptacle 66 having its bottom wall disposed flat against the gear-side of the machine body and secured thereto by screws or other fastening elements engaged in the corresponding openings 67 and 68 of the housing and body respectively. The bottom wall of the housing is provided with the required number of apertures 69 to accommodate the body-supported spindles, etc. A flanged plate or cover 70 is attached to the receptacle by screws or other fasteners engaging, through openings 71 in the cover, with screw sockets 72 in the receptacle. An opening 74 in the cover elongated in the direction of adjustment of the lever, provides clearance for the exteriorly projecting end of the torque tube 17 to which the handle 20 is attached.

The operation of the machine is as follows: The deforming rolls being spaced apart, the end of the tubing to be beaded is disposed over the beaded part of the beading roll until the bead 16 enters the tubing to the desired extent, i. e., to its full, or less, front projecting length. In this position of the tube, a portion of the tubing wall is between the beading roll and the grooved roll. The adjusting screw 56 is then turned in the nut 62 to move the lever 14 downwardly until that portion of the tubing in direct contact with the bead is forced outwardly by the pressure of the bead and into the groove of the lower roll. Such portion is thus deformed to the general shape or curvature of the area of the bead in contact therewith. The handle 20 is then turned to cause the beading roll and the grooved roll, through the interconnecting gearing, to revolve in opposite directions and with the same circumferential speed. The pressure of the revolving deforming-rolls against the tubing causes the latter to revolve also and each succeeding section of the tubing passing between the rolls is processed or deformed by the rolls, the complete rotation of the tubing resulting in a raised surface or bead that extends completely around the outer periphery of the tubing. When the bead or collar is to be formed on the inner periphery of the tubing, the latter is disposed over the grooved roll and the pressure of the beaded roll is exerted on the tubing from the outside thereof.

The structure, operation, and advantages of the invention will be apparent from the foregoing description and minor changes in the construction and combination of the several parts of the machine may be made within the scope of the appended claims without departing from the nature and principles of the invention.

Having thus described the invention, what is claimed as new is:

1. A metal-working machine having, in combination, rotatable cooperating work-deforming units between which the work to be deformed is placed, said units comprising a beaded roll and a peripherally grooved roll respectively and being rotatable in a common plane and relatively adjustable in the plane of rotation about a common axis perpendicular to the said plane for varying the distance between their work-engaging surfaces, a rotatable gear having its center of movement at the said common axis of adjustment of the work-deforming units, means for rotating the beaded roll, and gearing operatively connecting the work-deforming units with the said gear for transmitting the motion of the beaded roll through said gear to the peripherally grooved roll at a gear ratio causing the rolls to be rotated with the same circumferential speed.

2. A metal-working machine having, in combination, rotatable cooperating work-deforming units between which the work to be deformed is placed, said units being positioned in a common plane of rotation, means carrying one of the said units and pivotally supported for angular adjustment about an axis perpendicular to the plane of rotation of the said units for varying the distance between the work-engaging portions of the units, a rotatable motion-receiving-and-transmitting element having its center of rotation in coincidence with the axis of the adjustable unit-carrying means, and motion-transmitting means operatively connecting the respective units with the said element for transmitting the rotation of either unit through the said element to the other unit.

3. A metal-working machine having, in combination, rotatable cooperating work-deforming units between which the work to be deformed is placed, said units being positioned in a common plane of rotation, means carrying one of the said units and pivotally supported for angular adjustment about an axis perpendicular to the plane of rotation of the said units for varying the distance between the work-engaging portions of the units, a rotatable motion-receiving-and-transmitting element having its center of rotation in coincidence with the axis of the adjustable unit-carrying means, and motion-transmitting means operatively connecting the respective units with the said element for transmitting the rotation of either unit through the said element to the other unit at a ratio causing the units to be rotated with the same circumferential speed.

4. A metal-working machine having, in combination, a supporting body, a rotatable work-deforming unit mounted on said body for contacting one side of the work to be deformed, a lever fulcrumed on the body to be moved angularly in a plane parallel to the plane of rotation of the said unit, a rotatable work-deforming unit mounted on the lever for contacting the opposite side of the work and supported by the lever with its plane of rotation in coincidence with the plane of rotation of the body-mounted unit, lever-adjusting means operable to move the lever about its fulcrum to and from a selected angular position with respect to the body-mounted unit for varying the distance between the units, a rotatable motion-receiving-and-transmitting element having its center of rotation at the fulcrum of the lever, means for rotating one of the work-deforming units, and motion-transmitting means operatively connecting the said units with the said element for transmitting the motion of the

rotated unit through said element to the other unit.

5. A metal-working machine having, in combination, a supporting body, a rotatable work-deforming unit mounted on said body for contacting one side of the work to be deformed, a lever fulcrumed on the body to be moved angularly in a plane parallel to the plane of rotation of the said unit, a rotatable work-deforming unit mounted on the lever for contacting the opposite side of the work and supported by the lever with its plane of rotation in coincidence with the plane of rotation of the body-mounted unit, lever-adjusting means operable to move the lever about its fulcrum to and from a selected angular position with respect to the body-mounted unit for varying the distance between the units, a rotatable motion-receiving-and-transmitting element having its center of rotation at the fulcrum of the lever, means for rotating one of the work-deforming units, and motion-transmitting means operatively connecting the said units with the said element for transmitting the motion of the rotated unit through said element to the other unit at a ratio causing the units to be rotated with the same circumferential speed.

6. A metal-working machine having, in combination, a supporting body, a rotatable work-deforming unit mounted on said body for contacting one side of the work to be deformed, a lever fulcrumed on the body to be moved angularly in a plane parallel to the plane of rotation of the said units, a rotatable work-deforming unit mounted on the lever for contacting the opposite side of the work and supported by the lever with its plane of rotation in coincidence with the plane of rotation of the body-mounted unit, lever-adjusting means operable to move the lever about its fulcrum to and from a selected angular position with respect to the body-mounted unit for varying the distance between the units, a rotatable motion-receiving-and-transmitting element having its center of rotation at the fulcrum of the lever, means for rotating one of the work-deforming units, and motion-transmitting means operatively connecting the said units with the said element for transmitting the motion of the rotated unit through said element in reverse to the other unit and at a ratio causing the units to be rotated with the same circumferential speed in opposite directions.

7. A metal-working machine having, in combination, a supporting body, a rotatable beading roll mounted on the body for contacting one side of the work to be deformed, a lever fulcrumed on the body to be moved angularly in a plane parallel to the plane of rotation of the beading roll, a rotatable peripherally-grooved roll mounted on the lever for contacting the opposite side of the work and supported by said lever with its plane of rotation in coincidence with the plane of rotation of the beading roll, means operatively associated with the lever for moving the latter angularly to vary the distance between the rolls, a rotatable gear on the body having its center of rotation at the fulcrum of the lever, means for rotating the beading roll, and gearing operatively connecting the beading roll and the grooved roll respectively with the said gear for transmitting the rotation of the beading roll through the said gear in reverse to the grooved roll and at a ratio causing the rolls to be rotated with the same circumferential speed in opposite directions.

8. A metal-working machine having, in combination, a body, a rotatable work-deforming unit mounted on the body, a lever pivoted to the body for movement in a plane parallel to the plane of rotation of the body-mounted unit, a torque tube journaled in the lever with its axis parallel to the axis of the body-mounted unit, a work-deforming unit disposed in the plane of rotation of the body-mounted work-deforming unit and having a shank extending into the torque tube and supported and reinforced thereby, an adjustable connection between the body and the lever operable for moving the lever to vary the distance between lever-carried unit and the body-mounted unit, means for rotating the torque tube and its associated work-deforming unit in unison, a rotatable motion-receiving-and-transmitting element on the body with its center of rotation at the pivot of the lever, and motion-transmitting means operatively connecting the work-deforming units with the said element for transmitting the rotation of one unit through said element to the other unit.

9. A metal-working machine having, in combination, a body, a rotatable work-deforming unit mounted on the body, a lever pivoted to the body for movement in a plane parallel to the plane of rotation of the body-mounted unit, a torque tube journaled in the lever with its axis parallel to the axis of the body-mounted unit, a work-deforming unit disposed in the plane of rotation of the body-mounted work-deforming unit and having a shank extending into the torque tube and supported and reinforced thereby, an adjustable connection between the body and the lever operable for moving the lever to vary the distance between lever-carried unit and the body-mounted unit, means for rotating the torque tube and its associated work-deforming unit in unison, a rotatable motion-receiving-and-transmitting element on the body with its center of rotation at the pivot of the lever, and motion-transmitting means operatively connecting the work-deforming units with the said element for transmitting the rotation of one unit through said element in reverse to the other unit at a ratio causing the units to be rotated in opposite directions with the same circumferential speed.

10. A metal-working machine having, in combination, a body, a rotatable work-deforming unit mounted on the body, a lever pivoted to the body for movement in a plane parallel to the plane of rotation of the body-mounted unit, a torque tube journaled in the lever with its axis parallel to the axis of the body-mounted unit, a work-deforming unit disposed in the plane of rotation of the body-mounted work-deforming unit and having a shank extending into the torque tube and supported and reinforced thereby, an adjustable connection between the body and the lever operable for moving the lever to vary the distance between lever-carried unit and the body-mounted unit, means for rotating the torque tube and its associated work-deforming unit in unison, a rotatable gear on the body with its center of rotation at the pivot of the lever, and gearing operatively connecting the work-deforming units with the said gear for transmitting the rotation of one unit through said gear in reverse to the other unit at a ratio causing the units to be rotated in oppoiste directions with the same circumferential speed.

11. A metal-working machine having, in combination, a body, a rotatable work-deforming unit mounted on the body, a lever pivoted to the body for movement in a plane parallel to the plane of rotation of the body-mounted unit, a torque tube

journaled in the lever with its axis parallel to the axis of the body-mounted unit, a handle secured to the torque tube for rotating the same, a work-deforming unit disposed in the plane of rotation of the body-mounted unit and having a shank supported in the tube and bound to the handle through the tube to be rotated thereby, a rotatable motion-receiving-and-transmitting member having its center of rotation at the pivot of the lever, motion-transmitting means operatively connecting the said member with the said tube and body-mounted unit respectively for transmitting the rotation of the tube-mounted unit through said member to the body-mounted member, and adjusting means connecting the lever and the body and operable to move the lever for varying the distance between the said units.

12. A metal-working machine having, in combination, a body, a rotatable work-deforming unit mounted on the body, a lever pivoted to the body for movement in a plane parallel to the plane of rotation of the body-mounted unit, a torque tube journaled in the lever with its axis parallel to the axis of the body-mounted unit, a handle secured to the torque tube for rotating same, a work-deforming unit in the plane of rotation of the body-mounted unit and having an integral shank supported in the tube and bound to the handle through the tube to be rotated thereby, said body-mounted unit and said lever-carried unit having cooperating deforming surfaces respectively between which the work to be deformed is placed and the relative spacing of which is varied in conformity with the movement of the lever, an adjustable connection between the lever and the body operable to vary the angular setting of the lever, a gear on said body having its axis of rotation at the pivot of the lever, gearing connecting the said gear and the torque tube, and change-gearing connecting said gear and the body-mounted unit at a ratio causing the body-mounted unit to be rotated in the opposite direction to and with the same circumferential speed as the lever-carried unit.

13. A machine having, in combination, a supporting body, a work-deforming unit mounted on said body and including a rotatable peripherally-grooved member, a lever pivoted to the body for movement in a plane parallel to the plane of rotation of the said member, a torque tube journaled in the lever with its axis parallel to the axis of the said member, a handle secured to the said tube for turning same about its axis, a work-deforming unit including a slender comparatively fragile rod filling the bore of the tube from end to end thereof to be supported and reinforced by said tube, said rod turning with said tube and having a peripheral bead matching the groove in the body-mounted member and disposed in the plane of rotation of the groove, adjustable means connecting the lever and the body and operable to move the lever for varying the distance between the bead and the groove of the respecting units, a gear on said body having its axis of rotation at the pivot of the said lever, and gearing connecting the said gear with the said torque tube of the lever-carried unit and with the body-mounted unit respectively and operative for causing the rotation of the units to be in relatively opposite directions and at the same circumferential speed.

14. A metal-working machine having, in combination, rotatable cooperating work-deforming units between which the work to be deformed is placed, said units being rotatable in a common plane and relatively adjustable in the plane of rotation about a common axis perpendicular to the said plane for varying the distance between their work-engaging surfaces, an adjusting screw swiveled on one of the units for rotation about its longitudinal axis without longitudinal movement relative to the unit, a nut on the other unit threadedly engaged with the screw and movable about a fixed axis for maintaining a constant angle between itself and the screw throughout the range of adjustment of the units, a rotatable motion-receiving-and-transmitting element having its center of movement at the said comon axis of adjustment of the work-deforming units, means for rotating one of the work-deforming units, and motion-transmitting means operatively connecting the work-deforming units with the said element for transmitting the motion of the rotated unit through said element to the other unit.

15. A metal-working machine having, in combination, a supporting body, a rotatable work-deforming unit mounted on said body for contacting one side of the work to be deformed, a lever fulcrumed on the body to be moved angularly in a plane parallel to the plane of rotation of the said unit, a rotatable work-deforming unit mounted on the lever for contacting the opposite side of the work and supported by the lever with its plane of rotation in coincidence with the plane of rotation of the body-mounted unit, lever-adjusting means operable to move the lever about its fulcrum to and from a selected angular position with respect to the body-mounted unit for varying the distance between the units and including an adjusting screw swiveled on the lever for rotation about its longitudinal axis without longitudinal movement relative to the lever and a nut threadedly engaged with the screw and operatively connected with the body and movable about a fixed axis to maintain a constant angle between itself and the screw throughout the range of adjustment of the lever, a rotatable motion-receiving-and-transmitting element having its center of rotation at the fulcrum of the lever, means for rotating one of the work-deforming units, and motion-transmitting means operatively connecting the said units with the said element for transmitting the motion of the rotated unit through said element to the other unit.

16. A work-deforming machine having, in combination, a body, a rotatable work-deforming unit mounted on the body, a gear-spindle carried by the body and extending outwardly thereof in parallelism with the axis of the rotatable unit, connecting gearing between the gear-spindle and the rotatable unit, a lever fulcrumed on said gear-spindle, a gear-spindle carried by and journaled in the lever and extending outwardly thereof in the same direction as and in parallelism with the body-carried gear-spindle, gearing between and connecting the lever-carried gear-spindle and the body-carried gear-spindle, a work-deforming unit operatively connected with the lever-carried gear-spindle to turn therewith and cooperatively positioned with respect to the body-mounted work-deforming unit, and a spindle-supporting member fixed to the lever and supportingly engaging the outwardly extending portions of the body-carried spindle and lever-carried spindle, respectively.

17. A work-deforming machine having, in combination, a body, a work-deforming unit on one side of the body, a gear-housing on the opposite side of the body, a rotatable gear-spindle jour-

naled in said body and having one end fixed to and supportingly engaged with the said unit and having its other end disposed within the gear-housing, a gear fixed on said other end of the rotatable gear-spindle, a gear-spindle fixed in the body in parallelism with the rotatable gear-spindle and extending into the gear-housing, a rotatable gear on the extending portion of the fixed spindle, gear between and connecting the gears of the said fixed and rotatable gear-spindles, a lever fulcrumed on the said fixed gear-spindle, a rotatable gear-spindle journaled in the lever in parallelism with the said fixed and rotatable gear-spindles of the body and having a portion extending into the gear-housing, a gear fixed on the extending portion of the lever-carried gear-spindle and in mesh with the gear on the fixed gear-spindle of the body, a spindle-supporting member fixed to the lever and extending into the gear housing and supportingly engaging the lever-carried gear-spindle and the fixed-gear spindle of the body, and a work-deforming unit operatively connected with the lever-carried gear-spindle to rotate therewith and cooperatively positioned with respect to the other work-deforming unit.

MAXIMILIAN v. BERLICHINGEN.
MARGOT v. BERLICHINGEN.