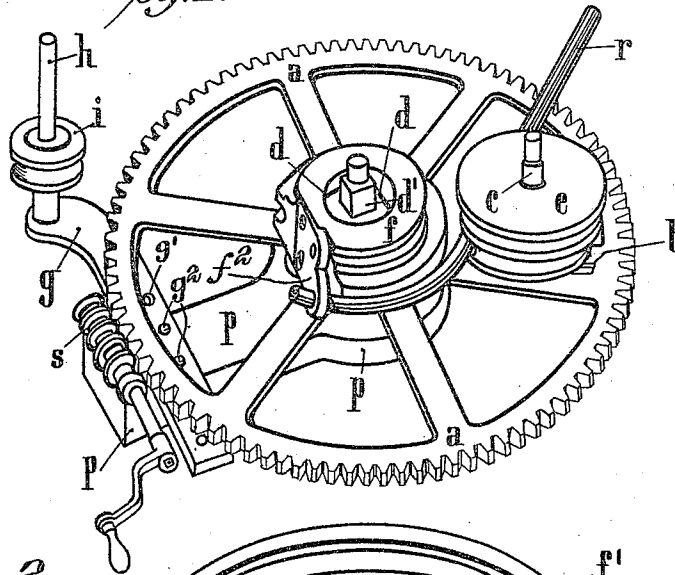


A. KLARWASSER.  
BENDING APPARATUS.  
APPLICATION FILED NOV. 7, 1910.

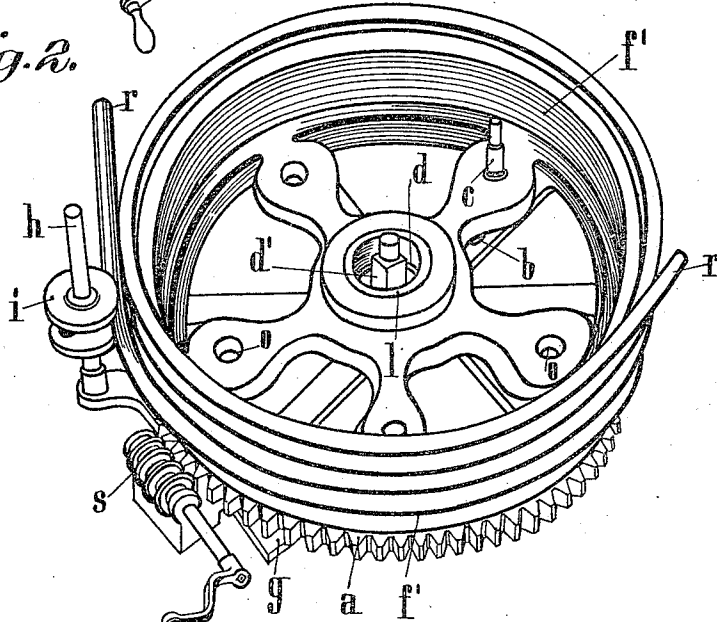
1,060,461.

Patented Apr. 29, 1913.

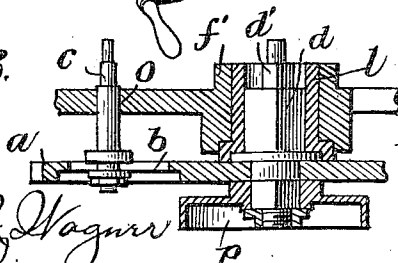
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



Witnesses:

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# UNITED STATES PATENT OFFICE.

ARNOLD KLARWASSER, OF COLOGNE, GERMANY.

## BENDING APPARATUS.

1,060,461.

Specification of Letters Patent.

Patented Apr. 29, 1913.

Application filed November 7, 1910. Serial No. 591,136.

*To all whom it may concern:*

Be it known that I, ARNOLD KLARWASSER, a subject of the Emperor of Germany, residing at Cologne, Germany, have invented a new and useful Bending Apparatus, of which the following is a specification.

The present invention refers to an apparatus for bending pipes and rolled pieces. The apparatus is portable and allows of bending pieces of various diameters and thicknesses; it is also adapted to make cylindrical and conical coils, and altogether, the form of the bends produced on it depends on the templet and the pressure roller only. In the accompanying drawing the bending apparatus is shown in perspective view in use for bending pipes.

Figure 1 shows the apparatus arranged for bending curves of small diameter. Fig. 2 illustrates a bending templet for curves or coils of larger radii or for making a cylindrical serpentine. Fig. 3 is a detail sectional view, illustrating the manner of mounting the templet.

In a base plate  $p$  is rigidly secured the square stud  $d$  on the top of which a smaller square  $d^1$  is provided to support an increased range of adjustment. At the rounded foot of the square stud  $d$  is rotatably fitted the worm wheel  $a$ , which has a radial slot  $b$ , in which a bolt  $c$  may be radially adjusted; and the said bolt  $c$  is held in suitable manner in this slot, as by means of a set screw (not shown). On the square stud  $d$  is removably fitted the exchangeable templet  $f$ , provided with a square bore corresponding with said square stud  $d$ . On the bolt  $c$  is rotatably fitted the likewise exchangeable pressure roller  $e$ . To allow using this arrangement for various sizes of work both the templet  $f$  and the roller  $e$  are stepped and provided with several grooves of various sizes. The base plate  $p$  further carries a worm  $s$ . When a pipe is to be bent to a short radius, it is passed between templet  $f$  and roller  $e$ , the templet being provided with a suitable device  $f^2$  for holding the pipe. By turning the worm  $s$  the worm wheel  $a$  will be rotated; and with it will rotate the roller  $e$ , thereby forcing the pipe into the desired groove in the templet  $f$ .

To allow using the same apparatus for bending curves or coils of larger radii, the roller  $e$  is lifted from the bolt  $c$  and the templet  $f$  from the square stud  $d$ . Then a sleeve  $l$  is placed on the stud  $d$ , to serve as

a journal for the templet  $f^1$ , and the bolt  $c$  is inserted through one of the holes  $o$  provided in the spokes of the templet and engaged in the slot  $b$  of the wheel  $a$ , so that on the wheel  $a$  being rotated, also the templet will be made to revolve. An adjustable and fixable arm  $g$  is provided either as an extension of the base plate or independently thereof, carrying a pin  $h$  on which the pressure roller  $i$  is placed with a running fit and capable of vertical displacement. The arm  $g$  is provided with a plurality of perforations  $g^1$  and is adjustably secured to the base plate by fastening devices  $g^2$ . The longitudinal adjustment of the arm carries the pin  $h$  toward and from the templet  $f$ . In the constructional form shown in Fig. 2 the templet  $f^1$  is shown with grooves resembling the threads of a screw, in which grooves the pipe  $r$  will be bent to a cylindrical serpentine.

From the aforesaid it is obvious that it is possible to turn out bends of various sizes and curvatures with the same apparatus by simply adjusting the arm and exchanging the templet. The apparatus may be driven by any suitable means; that illustrated in the drawing is supposed to be operated by a crank handle.

When curves of a large radius are being bent, and the templet projects far beyond the wheel  $a$ , it will be necessary to extend the spindle of the worm or the said spindle will have to be operated by a ratchet and pawl gear. For bending serpentines a templet with up to four turns will be sufficient to produce a cylinder of any length required, as by reversing the wheel, the templet may be screwed out of the coils previously made and the coiling operation be repeated by forcing the pipe into the cleared thread-grooves on the wheel as it is again rotated in a forward direction.

The bending of pipes with the apparatus constructed in accordance with the present invention has the great advantage of obviating the necessity of swinging the pipe about, and the pipe operated on will begin to follow the templet from a predetermined point and will not require any adjustment or change in its position.

I claim:

1. A portable apparatus for bending pipes and rolled pieces including a base plate having a pivot, a wheel mounted for rotation on the pivot, means for rotating the

5 wheel, a templet mounted on the said pivot and having means for holding the material to be bent, a pressure roll adjustably mounted beyond the templet and movable inwardly and outwardly toward and from the same, said templet and pressure roll having grooves to receive the material and one of them being connected with and rotated by the wheel.

10 2. A portable apparatus for bending pipes and rolled pieces including a base plate having a pivot, a wheel mounted for rotation on the pivot, means for rotating the wheel, a templet also mounted on the pivot and having means for holding the material to be bent, a pin arranged in parallelism with the said pivot and adjustable inwardly and outwardly toward and from the same, a pressure roll mounted on the said pin and co-acting with the templet, said templet and pressure roll being provided with grooves to receive the material to be bent and one of them being connected with and rotated by the wheel.

25 3. A portable apparatus for bending pipes and rolled pieces including a base plate provided with an extension having a bearing, a stud rigid with and carried by the base plate, a worm wheel mounted for rotation on the stud, a worm journaled in the bearing of the base plate and engaging the same, a templet also mounted on the stud and provided with means for holding the material to be bent, and a pressure roll co-acting with the templet and adjustable toward and from the same, said templet and pressure roll being provided with grooves to receive the material.

40 4. In a portable apparatus for bending pipes and rolled pieces in curves of large radius, the combination of a base, a templet rotatably mounted on the base and provided with means for holding the material to be bent, and a pressure roller mounted at a fixed point independently of the templet and carried by the base and adjustable toward and from the templet and slidable in a plane parallel with the axis of the templet.

50 5. In a portable apparatus for bending pipes and rolled pieces in curves of a large radius, the combination of a base plate having an extension adapted as a bearing for a worm, a square stud in said base plate, on the foot of said stud a rotatable worm wheel in engagement with said worm, with a sleeve fitted on the square of said stud, a templet of large radius journaled on said sleeve, means for coupling said tem-

plet with the worm wheel, on said base plate an adjustable arm carrying a pressure roller revolving and capable of vertical displacement on a pin and means for rotating said worm.

6. In a portable apparatus for bending pipes and rolled pieces in curves of a large radius, the combination of a base plate having an extension adapted as a bearing for a worm, a square stud in said base plate, on the foot of said stud a rotatable worm wheel in engagement with said worm, with a sleeve fitted on the square of said stud, a templet of large radius journaled on said sleeve, means for coupling said templet with the worm wheel, on said base plate, an adjustable arm carrying a pressure roller revolving and capable of vertical displacement on a pin, a crank handle on the spindle of said worm to project beyond the templet.

7. In a portable apparatus for bending pipes and rolled pieces in curves of a large radius, the combination of a base plate having an extension adapted as a bearing for a worm, a square stud in said base plate, on the foot of said stud a rotatable worm wheel in engagement with said worm, with a sleeve fitted on the square of said stud, a templet of large radius journaled on said sleeve, means for coupling said templet with the worm wheel, on said base plate an adjustable arm carrying a pressure roller revolving and capable of vertical displacement on a pin, and means for rotating the spindle of the said worm.

8. In a portable apparatus for bending pipes and rolled pieces in curves of a large radius, the combination of a base plate having an extension adapted as a bearing for a worm, a square stud in said base plate, on the foot of said stud a rotatable worm wheel in engagement with said worm, with a sleeve fitted on the square of said stud, a templet of large radius journaled on said sleeve, grooves in the form of a screw thread on the face of said templet, adapted to bend the pipe in serpentine, means for coupling said templet with the worm wheel, on said base plate an adjustable arm carrying a pressure roller revolving and capable of vertical displacement on a pin, and means for rotating said worm.

In witness whereof I have hereunto set my hand in presence of two witnesses.

ARNOLD KLARWASSER.

Witnesses:

JACOB PLANTS,  
LOUIS VANDORN.