No. 664,771. Patented Dec. 25, 1900.

W. W. McCALLUM.

MECHANISM OR APPARATUS FOR BENDING TUBING.

(Application filed Apr. 12, 1900.)

(No Model.)

Fig. 1.

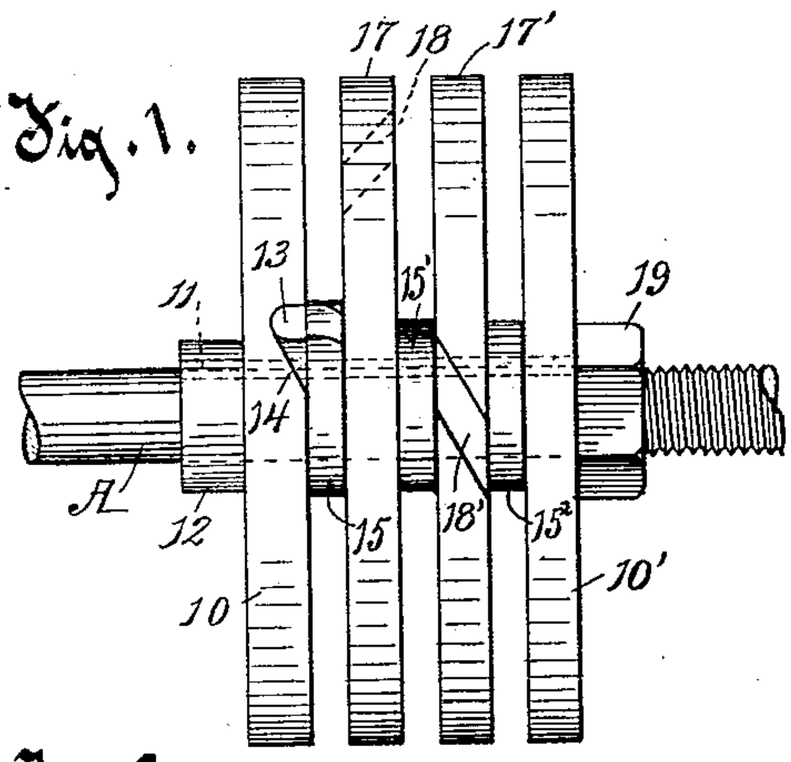


Fig. 2.

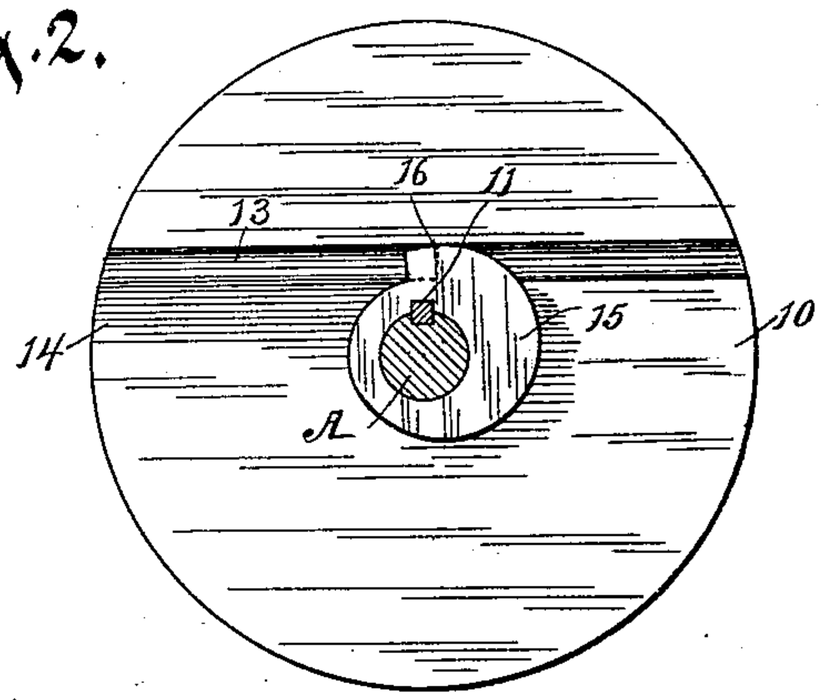


Fig. 3.

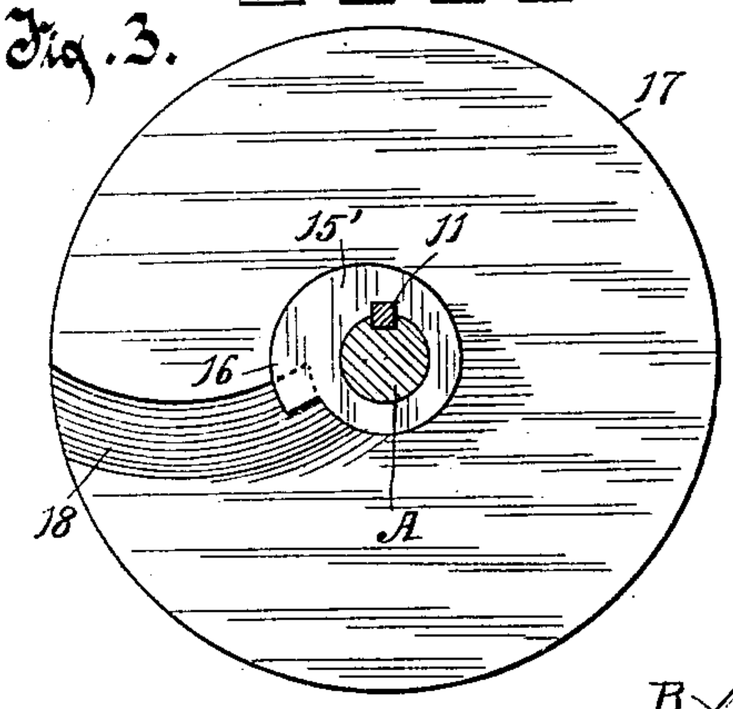


Fig. 4.

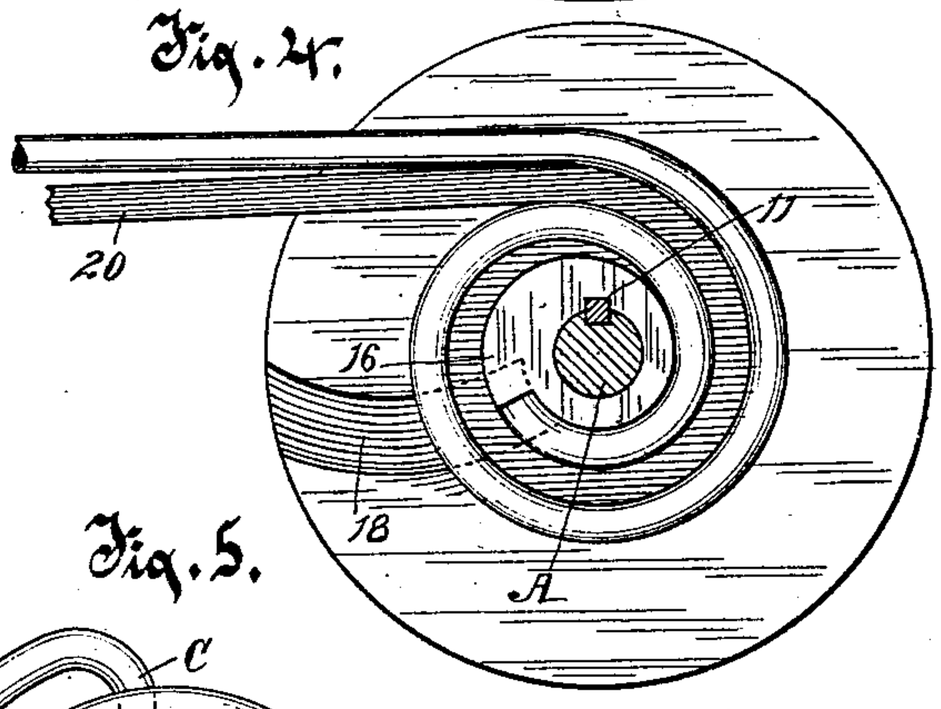


Fig. 5.

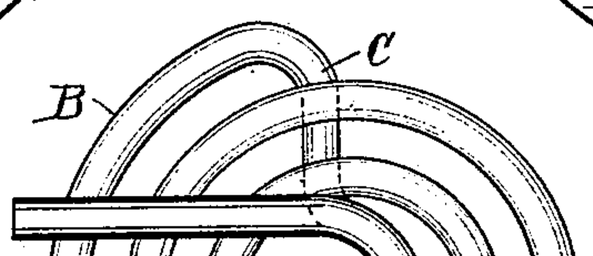


Fig. 8.

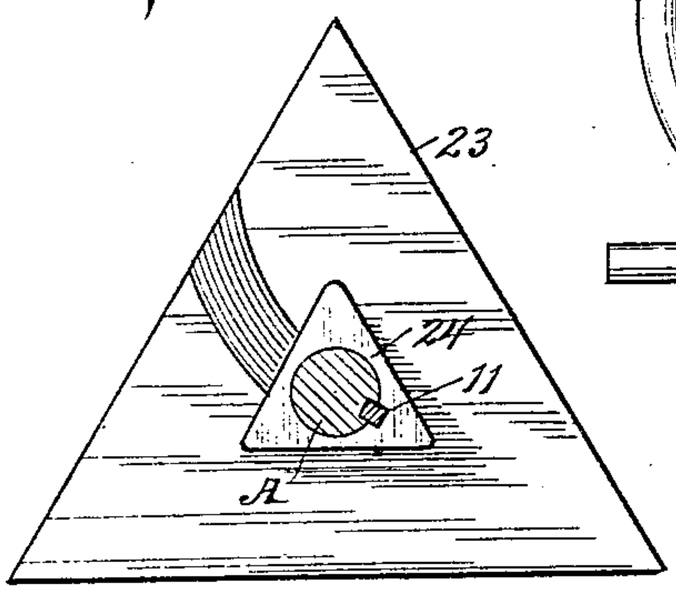


Fig. 7.

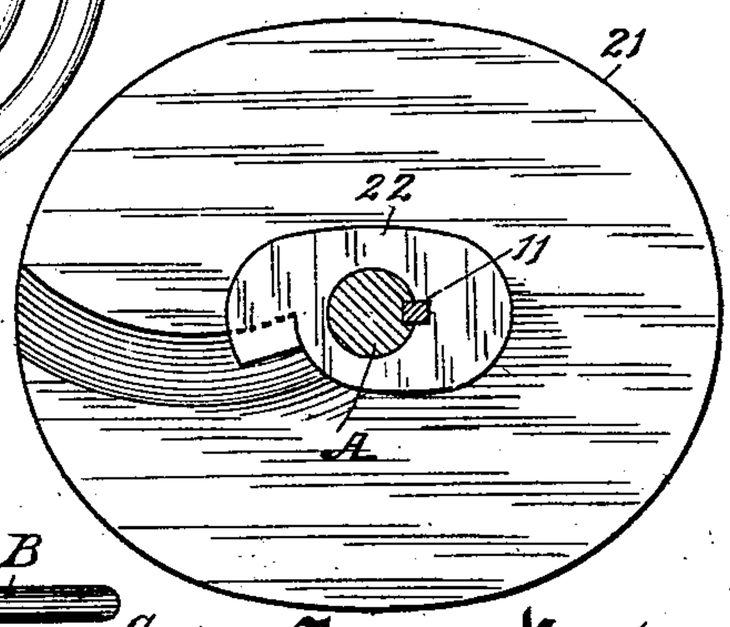
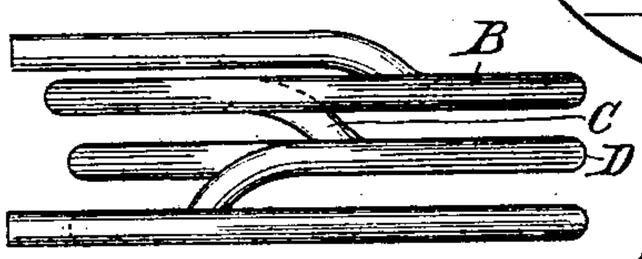


Fig. 6.



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UNITED STATES PATENT OFFICE.

WILLIAM WARNER McCALLUM, OF MILWAUKEE, WISCONSIN.

MECHANISM OR APPARATUS FOR BENDING TUBING.

SPECIFICATION forming part of Letters Patent No. 664,771, dated December 25, 1900.

Application filed April 12, 1900. Serial No. 12,517. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WARNER McCALLUM, of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a new and useful Improvement in Mechanism or Apparatus for Bending Tubing, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention relates to improved mechanism or apparatus for bending or coiling substantially straight metal tubing into curved or spirally-coiled form, and especially into a series of similar coils in parallel adjacent planes.

The invention consists of the mechanism and devices and the parts and combinations thereof, as herein described and claimed, or their equivalents.

In the drawings, Figure 1 is an elevation at the side of my improved mechanism for bending or coiling tubing. Fig. 2 is a transverse section of the construction shown in Fig. 1 adjacent to and showing the face of the initial plate and adjacent collar. Fig. 3 is a transverse section of the shaft adjacent to and showing the face of the second or other plate than the initial one shown in Fig. 2 and of an adjacent collar. Fig. 4 shows one of the plates and the related collar in connection with a tube being bent with the coils separated one from another. Fig. 5 is a plan view of tubing coiled by my improved mechanism and devices. Fig. 6 is an edge view of the coiled tubing shown in plan in Fig. 5. Fig. 7 is a modified form of the construction adapted for bending a tubing into oval coils. Fig. 8 is a construction adapted for bending tubing into triangular coils.

In the dawings, A is a fragment of a shaft or mandel, preferably of cylindrical form, which should be of such size and so mounted and driven as to adapt it for bending tubing of small or great diameter, as desired. An initial or base blate 10, which is advisably of disk form and may be of this circular or disk form in all cases, is secured either permanently or by a suitable key 11 releasably on the shaft. In the drawings, Fig. 1, the initial plate 10 is shown to be secured releasably to the shaft A by means of the key, and the back of the plate is placed against a collar 12, fixed on the shaft. As a convenient means for securing the end of the tubing to be bent to this plate, and thereby securing it in position for bending, I provide a groove 13 across the plate 10 adjacent to the shaft A, and the rearward wall of this groove is cut away, as shown at 14, in an oblique plane from near the bottom of the groove to the surface of the plate at a distance rearwardly therefrom from near the shaft outwardly to the edge of the disk. The depth of this groove is to be substantially equal to the diameter of the tubing to be bent. It will be understood that this construction provides for the insertion of the end of the straight tubing in the groove 13 from that edge of the disk at which the groove is cut away, as shown at 14, into the groove beyond the shaft A, so that when the shaft is rotated the end of the tubing will remain held in the distant portion of the groove and will escape from the groove along the inclined wall at 14. A collar or coil-core 15 is placed on the shaft adjacent to the face of the disk 10, which collar or coil-core is of such size circumferentially as the first line or circle of the coil is desired to be. This coil-core is preferably made separate and detachable from the shaft and from the adjacent disk, though it may be integral with one of the adjacent disks. It is preferably keyed to the shaft, as shown in Figs. 2, 3, and 4. This coil-core is also preferably provided with a shoulder 16, formed by increasing the radial width of this collar or coil-core eccentrically to the locality of the shoulder 16, where the collar is abruptly lessened in radial width, forming the substantially radially-extending shoulder, as shown. The thin or narrow portion of the collar or coil-core is adjacent and opposite the groove 13 and its inclined or cut-away wall 14, so that in bending tubing that has been inserted in the groove 13 the tube will first follow closely about the thin portion of the coil-core and will be gradually carried away from the axis of the core until it reaches the shoulder 16, where it will be so much farther from the axis of the core as equals the diameter of the tubing. It will be noted that the shoulder 16 is as wide radially substantially as the groove 13, or, in other words, as wide radially as the thickness of the tubing to be bent. This coil-core 15 is

also substantially as long in the direction of the shaft as the diameter of the tubing to be bent. Against this coil-core 15 and on the shaft A a second plate 17 is placed and is secured releasably to the shaft by the key 11. If the pipe is to be bent into a plurality of coils in parallel planes, this second plate is provided with a radial slot 18, preferably slightly curved radially, as shown in Figs. 3 and 4, which slot extends through the plate from surface to surface in an oblique direction to the surface, the inclination of the walls of the slot being rearwardly in the direction of the rotation of the plates from the surface that is nearest to the plate 10 toward the other surface. This construction provides opportunity whereby when a coil of the tubing has been made between the plates 10 and 17, consisting of several circles of coils, as shown in Figs. 5 and 6, the tubing from the exterior circle B can be bent into the slot 18 and across this plate in the slot 18 to the other surface of the plate and at the same time carried radially inwardly, as shown at C in Figs. 5 and 6, to a coil-core on the other side of the plate 17. This provides for a transverse tube-coil connection between a coil B in one plane and a coil D in another plane. At the outer side of the plate 17 another coil-core 15′, substantially like the coil-core 15, is placed on the shaft A, and another plate 17′ is placed on the shaft against the coil-core 15′, which plate, if another coil of the tube is to be formed, is also slotted radially at 18′ as the plate 17 is slotted at 18, and another coil-core 15^2 is placed outside of the plate 17′ on the shaft. If still other coils of the pipe are to be made, other plates like the plate 17 and other coil-cores like the coil-core 15 may be placed on the shaft to such number as additional coils of tubing are to be made. For a plate for the exterior of the last coil to be formed a non-slotted plate 10′ is employed, which is placed on the shaft against the adjacent coil-core, and these several plates and coil-cores being secured releasably to the shaft by the key 11 or its equivalent they are held in place up to the plate 10 conveniently by a nut 19, turning by its thread on a corresponding thread on the shaft or mandrel A. It will be noted that the several coil-cores having the eccentric and shouldered form are placed on the shaft in the same position relative to the radial slots in the preceding plates that the coil-core 15 has to the plate 10, as shown in Fig. 2 and as hereinbefore described. This relation of the other coil-cores to the slots in the preceding plates is shown in Fig. 3.

It will be understood that having devices put together as already described and as is illustrated by the construction in Fig. 1 the attendant inserts the tubing in the groove 13 beyond the shaft, that thereupon on causing the shaft to rotate slowly and holding the projecting portion of the tubing steady the tubing will be coiled about the coil-core 15 and upon and about itself, forming a spiral coil, and that when this coil becomes substantially as large diametrically as the plate 10 the tubing can be bent into the slot 18 of the plate 17, and as the plate continues to revolve the tubing can be readily bent and carried inwardly of the radial slot and to the opposite surface of the plate 17 onto the succeeding coil-core 15′, about which another coil can be formed in the manner described. This process can be continued to any extent desired, forming a plurality or series of coils. It is, however, desirable for many purposes that the circles of the tubing in these several coils shall be separated one from another by a greater or less distance, and for this purpose I employ a coil-spreading device 20, which consists of a strip of flexible material, which may be firm hard sole-leather or, more desirably, lead, the strip being of such width as to substantially fill the space between two adjacent plates 10 17 and of such thickness as to spread the circles of the tubing to such extent as desired. It will be understood that by removing the nut 19 from the end of the shaft or mandrel A the plates and the coil-cores can be removed from the shaft and the coils of tubing taken therefrom, and the coil-spreading device or devices 20 can then be removed from the coils.

The plate 21 and coil-core 22 shown in Fig. 7 are substantially like the plate 17 and the coil-core 15′ of Figs. 1 and 3, except that the plate and the coil-core are made in oval form with reference to bending tubing in coils of oval form. The plate 23 and coil-core 24 shown in Fig. 8 are in triangular form to illustrate a form of construction that is adapted for bending tubing in triangular coils. These modified forms of construction (shown in Figs. 7 and 8) are merely to illustrate the fact that by means of my mechanism or apparatus when made in suitable form tubing may be bent into coils of any form desired.

What I claim as my invention is—

1. The combination of a revoluble shaft, an initial plate on and revoluble with the shaft, said plate having a groove for taking and holding the end of tubing, a coil-core on the shaft adjacent to said plate, and a second plate on and revoluble with the shaft at a distance from the initial plate substantially equal to the diameter of the tubing to be bent, said second plate being secured to the shaft releasably.

2. The combination of a revoluble shaft, an initial plate on and revoluble with the shaft, means in the plate for taking and holding the end of tubing, other plates on and revoluble with and severally removable from the shaft, the plates being separated a distance from each other and the plate or plates intermediate of the end plates of the series of plates being slotted radially from near the shaft to the outer edge.

3. The combination of a revoluble shaft, an initial plate on and revoluble with the shaft, means in the plate for taking and holding the

end of tubing, other plates on and revoluble with and severally removable from the shaft, the plate or plates intermediate of the end plates being slotted radially from near the shaft to the outer edge, and independent coil-cores on the shaft extending from a plate to the adjacent plate substantially as long as the diameter of the tubing to be bent.

4. In mechanism for bending tubing, a shaft, an initial radially-projecting plate thereon, one or more removable radially-projecting plates on the shaft and adjacent to but at a predetermined distance from the initial plate and from each other, the intermediate plate or plates being slotted radially from near the shaft to the outer edge, coil-cores about the shaft between the plates, each core being circumferentially eccentric in form and provided with a radially-disposed shoulder immediately in front (in the direction of motion) of the radial slot in the preceding plate, and means for securing the removable plates and the cores detachably to the shaft.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM WARNER McCALLUM.

Witnesses:
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ANNA V. FAUST.