(No Model.) 2 Sheets—Sheet 1.

F. R. GROUT.

MACHINE FOR SPIRALLY CORRUGATING SHEET METAL TUBES.

No. 286,293. Patented Oct. 9, 1883.

Fig. 1.

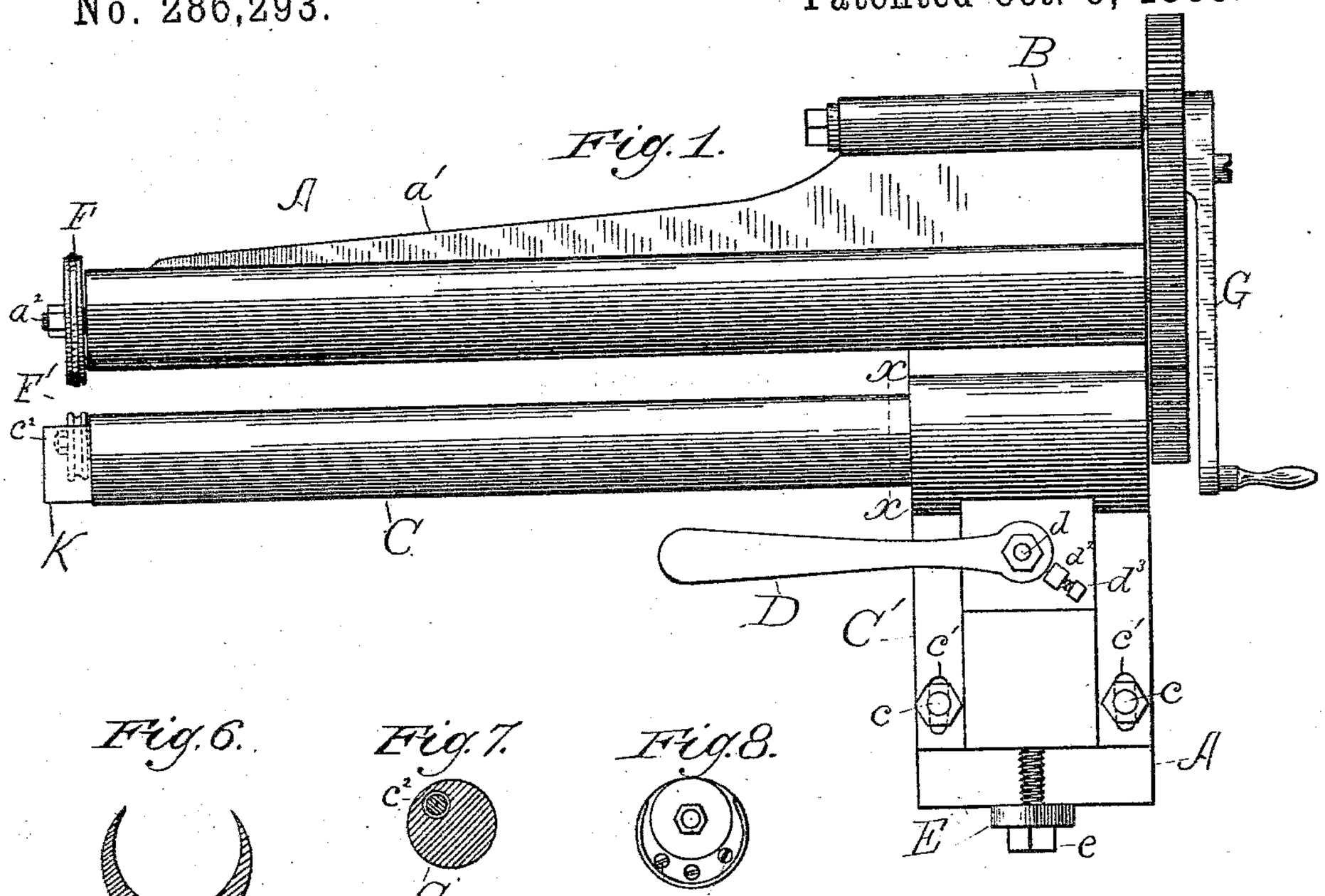


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 2.

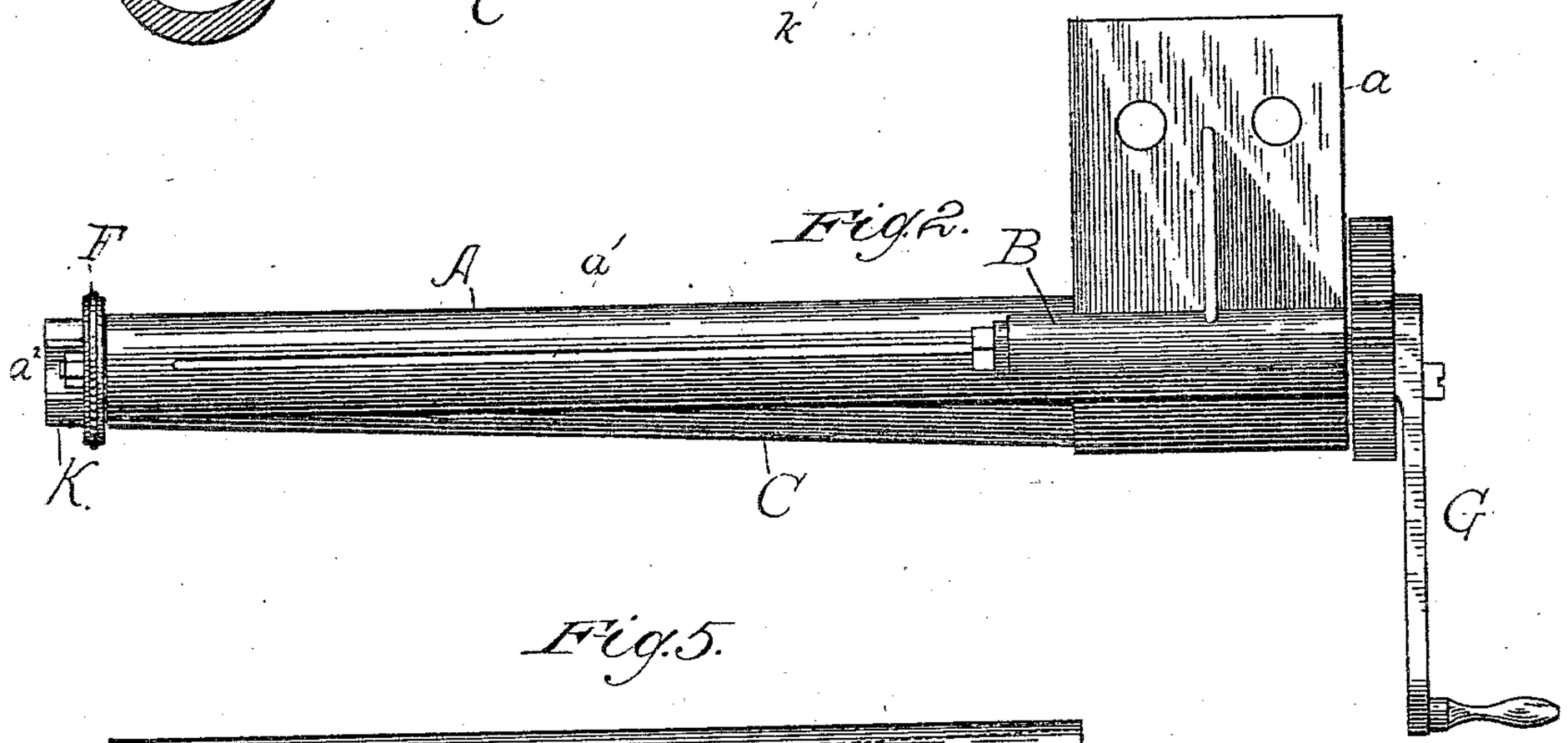


Fig. 5.

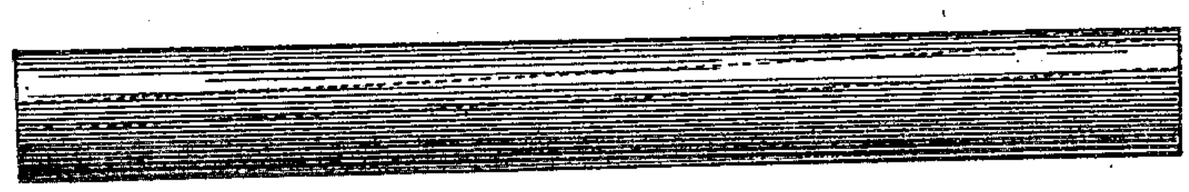


Fig. 9.

Witnesses.
Will R. Onthank Jr.
W. G. Rainey.

Inventor.
Frank R. Grout.
By D. H. Fletcher.
Atty.

(No Model.) 2 Sheets—Sheet 2.

F. R. GROUT.

MACHINE FOR SPIRALLY CORRUGATING SHEET METAL TUBES.

No. 286,293. Patented Oct. 9, 1883.

Fig. 3.

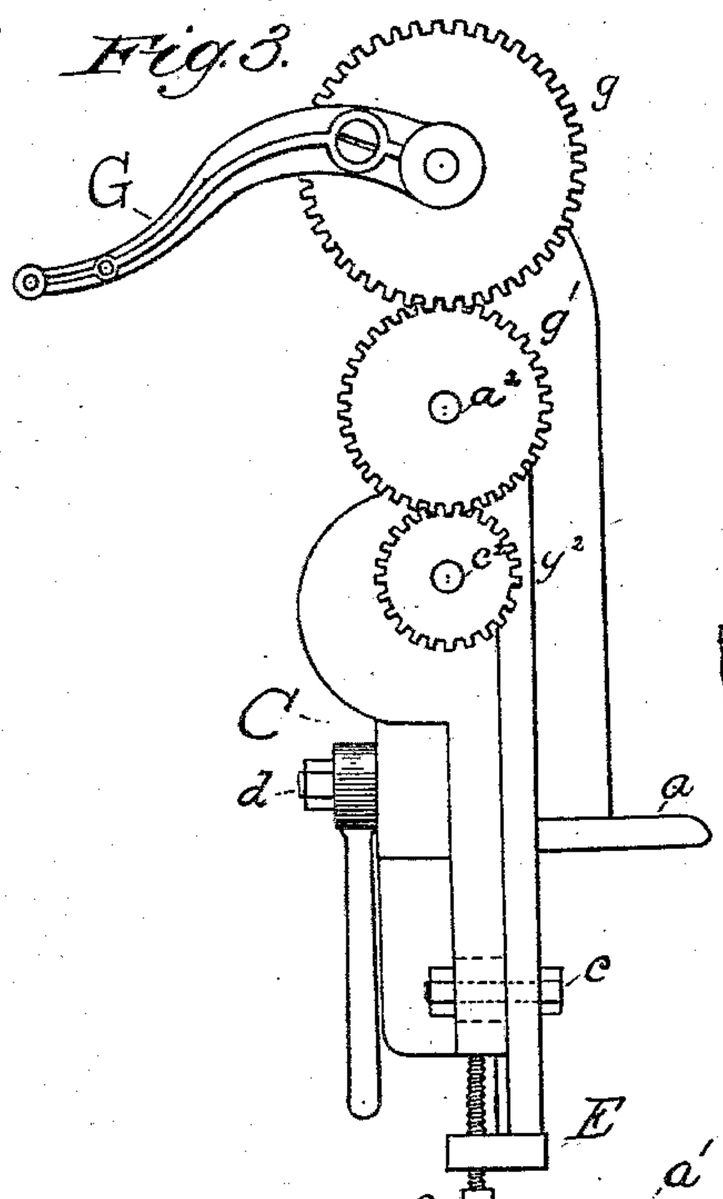


Fig. 10.

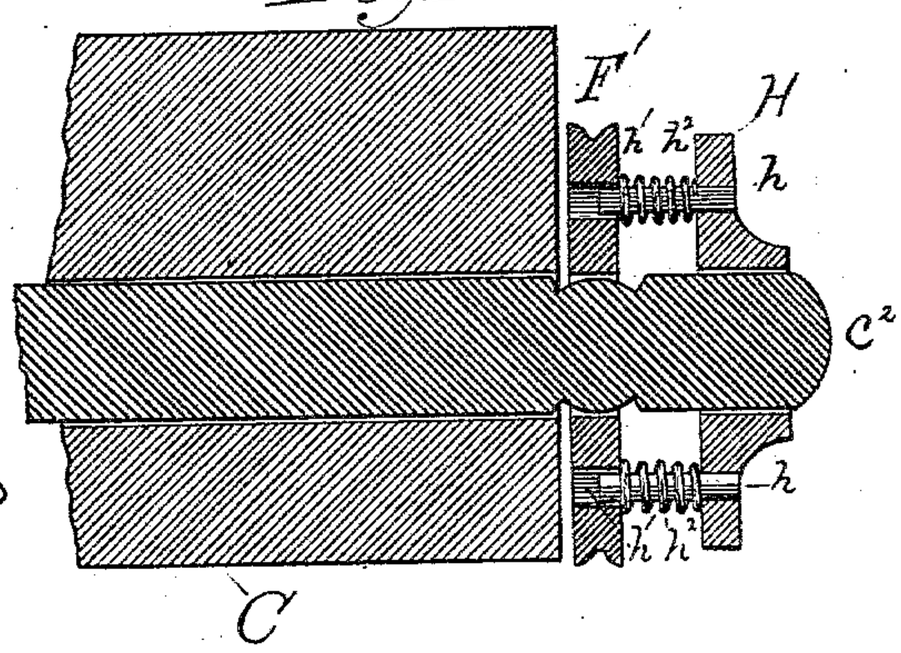


Fig. 4.

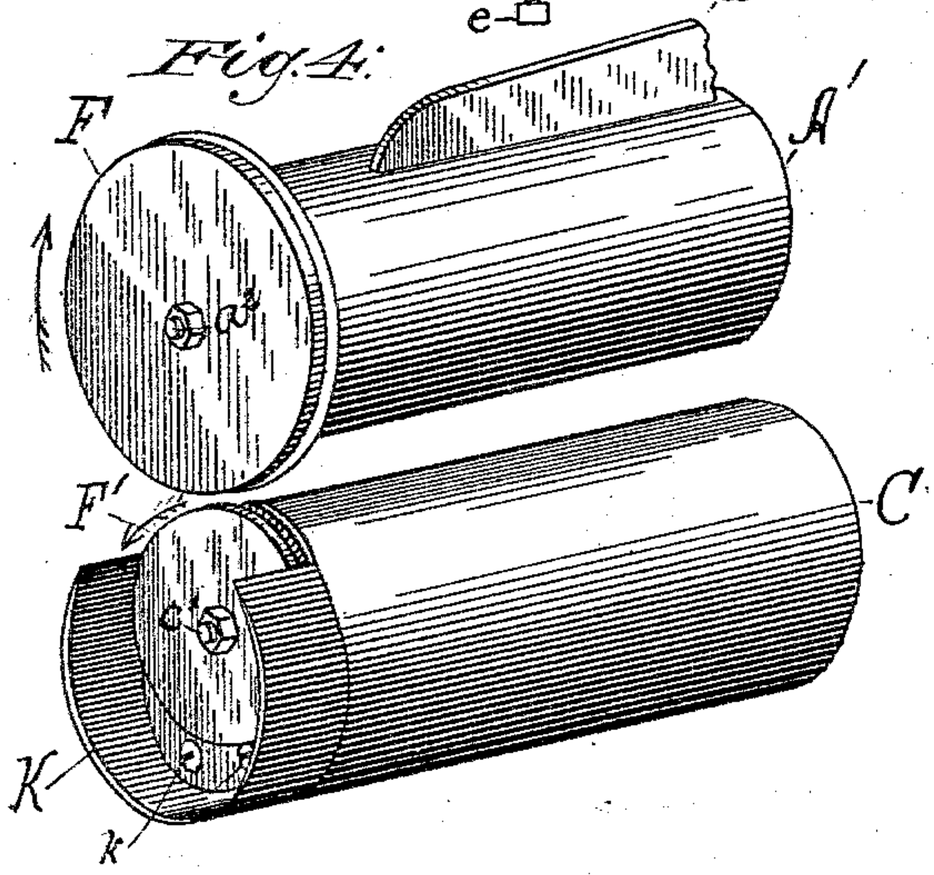
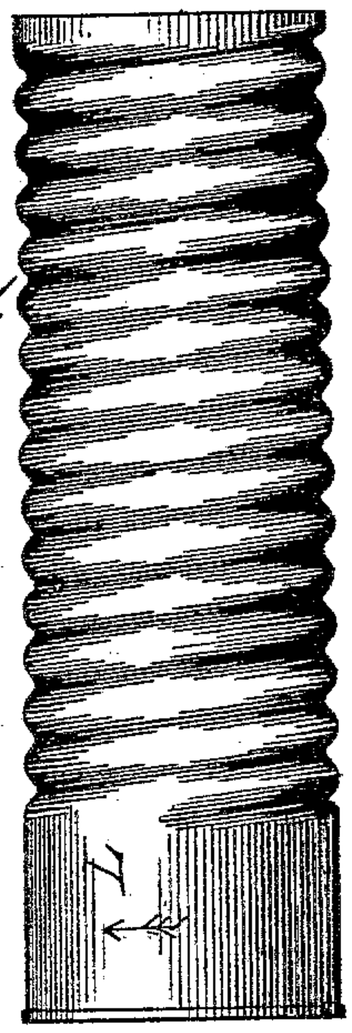


Fig. 11.



Witnesses.
W. R. Onishundro.
W. G. Rainey

Inventor
Frank R. Grout
By
D. H. Fletcher,
Atty.

UNITED STATES PATENT OFFICE.

FRANK R. GROUT, OF CHICAGO, ILLINOIS.

MACHINE FOR SPIRALLY CORRUGATING SHEET-METAL TUBES.

SPECIFICATION forming part of Letters Patent No. 286,293, dated October 9, 1883.

Application filed May 5, 1883. (No model.)

To all whom it may concern:

Be it known that I, FRANK R. GROUT, of Chicago, Illinois, have invented a new and useful Improvement in Machines for Spirally Corrugating Sheet-Metal Tubes, of which the following is a description, reference being had to the accompanying drawings, in which—

Figure 1 is a side view in elevation. Fig. 2 is a top view. Fig. 3 is a rear view. Fig. 4 is a detailed perspective view of the ends of the arm and mandrel, showing the revolving dies and the extension-lip of the mandrel. Fig. 5 is a view of the mandrel-sleeve, to illustrate the manner of enlarging the mandrel and of varying the "pitch" of the spiral corrugations. Fig. 6 is a section of the same. Fig. 7 is a transverse sectional view of the mandrel cut through the line *x x*, Fig. 1, showing the shaft therein for revolving one of the dies. Fig. 8 is an end view of said mandrel. Fig. 9 shows a reverse side of the lever and an eccentric for raising and lowering the mandrel from that shown in Fig. 1. Fig. 10 is a central longitudinal sectional view in detail of the outer end of the mandrel, exhibiting a modification of the construction shown in Fig. 1; and Fig. 11 is a view of a tube as corrugated by said machine.

Like letters of reference indicate like parts in the different figures.

The object of my invention is to provide a machine for corrugating metal tubes, which shall be simple in its construction, inexpensive, readily operated by unskilled workmen, and which shall expel the tubing from the former or mandrel as fast as the same is corrugated. I accomplish this object by placing said tubing upon a mandrel, rigidly sustained at one end, and of sufficient length to accommodate the necessary length of tubing, upon the end of which mandrel is a wheel, the periphery of which constitutes one part of a die or former, revolving upon an axis at an angle to the axis of the mandrel, the counterpart of which die is another wheel upon the end of an arm preferably above said mandrel, both of which wheels revolve simultaneously and in the same plane upon, preferably, parallel axes, rotated by suitable shafting, connected by gearing at the other end of the machine. The axis of the tube, when placed upon the mandrel and over the first-mentioned wheel, is oblique to the plane of said wheels, and when the latter are brought together, so as to indent the metal, and are then revolved, they in turn revolve the tube around the mandrel, grooving the same spirally, and gradually forcing it off the mandrel.

My invention is more particularly described as follows:

In the drawings, A represents the main framework of the machine, or the standard forming its support, to which I prefer to cast, rigidly, the arm A′, the part A being secured to a table or bench by bolts or screws through the flange *a*. In order to impart sufficient strength to the arm A′, and hold its outer end securely in position against upward pressure, I prefer to cast thereon the rib *a′*, which likewise forms a support for the journal-bearing B, which may be secured thereto in any convenient manner, but is preferably cast in one piece therewith.

Beneath the arm A′, and having its horizontal axis parallel therewith, I place a secondary arm or mandrel, C, which is rigidly secured to or cast in one piece with a suitable face-plate, C′, secured by bolts to the frame or standard A, which is likewise provided with a face-plate having suitable grooves, guides, or flanges to hold said plate C′ in a fixed position when adjusted. The two face-plates named are secured to each other by means of bolts *c c*, and the plate C′ is provided with slots *c′ c′*, to permit the same to be moved slightly up and down, which movement is accomplished by means of a lever, D, pivoted upon a bolt, *d*, secured rigidly to the frame or standard A, said lever being provided with an eccentric, *d′*, (more clearly shown in Fig. 9,) adapted to work in a slot in the face-plate C′. A stud, d^2, with a set-screw, d^3, Fig. 1, is adjusted to the face-plate C′ in such a position as to limit the movement of the lever D, for the purpose hereinafter shown. On the lower end of the frame, forming a part of the plate A, is a flange, E, through which is projected a set-screw, *e*, adapted to limit the downward movement of the plate C′.

It will be seen by reference to Fig. 2 that the axis of the arm A′ is not in the same vertical plane with that of the mandrel C, but stands at a slight angle thereto. Through the center or axis of the arm A′, I run a shaft, a^2,

Figs. 1, 2, 3, and 4, and parallel therewith, in the same vertical plane, I run a like shaft, c^2, through the arm or mandrel C. The ends respectively of the arms A′ and C are cut at right angles to the axis of the arm A′. On the ends of the shafts a^2 c^2 are rigidly secured, so as to revolve therewith, respectively, wheels F F′, which I prefer to have fit closely against the ends of said arms A′ C, in order to prevent any lateral movement. On the periphery of said wheels F F′ are formed, respectively, male and female dies, as clearly shown in the drawings, which are preferably milled, in order to prevent slipping upon the metal to be corrugated thereby. The wheels F F′ revolve in the directions shown by the arrows in Fig. 4 by means of the crank G and the gear-wheels g g' g^2, said gear-wheel g being essential in order to revolve said shafting at a proper speed and in the directions shown. It is obvious that the wheels F F′, when adjusted as described, must revolve in the same vertical plane, and the construction mentioned is the preferable one; but where it is necessary to use a small mandrel, it may be found impracticable to carry the shaft from one end to the other at the required angle to the axis of said mandrel without protruding or running out of the same entirely, so that tubing could not be placed thereon, in which event I prefer to bore the shaft-hole through said mandrel at as great an angle to its axis as possible without running out, and to place the wheel F′ upon said shaft c^2 in such a manner as to automatically adjust itself in its revolution to the face or beveled end of the mandrel C. This I accomplish by extending said shaft c^2 somewhat beyond the end of the mandrel C, as shown in Fig. 10, forming upon the same, as clearly shown in the drawings, a partial ball next to the end of said mandrel, and placing the wheel F′ loosely upon said ball. Upon the outer end of said shaft I rigidly secure an annular plate or disk, H, from the inner side of which I cause to project, preferably, four studs, h h, made long enough to project partially through holes h' h' through the wheel F′. Upon said studs or pins h h, I place spiral springs h^2 h^2, which serve to hold the wheel F′ constantly against the face of the end of the mandrel C, the pins h h serving to revolve said wheel, which it is obvious must move constantly in a plane at an angle oblique to its axis.

To avoid a variation in the corrugation of the tube as it is run off the mandrel, I secure to the end of said mandrel by screws k, or by any other suitable means, a lip, K, Figs. 4 and 8, of the same size as said mandrel, and projecting outwardly therefrom a sufficient distance to afford a support to said tubing until the same has passed out from between the dies. The mandrel C may be varied in diameter to correspond to different-sized tubing by placing thereon hollow sleeves, as shown in Fig. 5, of the required diameter, a cross-section of which, presenting the figure of a crescent, is shown in Fig. 6.

The operation of my improved spiral corrugating-machine is as follows: The tube, of which an example is shown in Fig. 11, is placed upon the mandrel C, which has been previously lowered from the arm A′ sufficiently therefor by means of the lever D. A reversal of said lever raises said mandrel, so as to bring the wheels F F′ in contact with the metal between, thereby forming an indentation of said metal between said dies at the point L, Fig. 11, care being taken to so adjust the set-screw d^3 that said dies may not be brought together with such force as to cut the metal. The handle G is then turned, and the wheels F F′, revolving in the direction shown in Fig. 4, rotate the tube between them in the direction shown by the arrow on said tube, and the plane of revolution of said dies, being at an angle to the axis upon which said tube revolves, grooves or corrugates the same in a spiral form, and in doing so necessarily removes it from the mandrel, upon which another may then be placed and the operation repeated. It is obvious that the relative pitch of this spiral is governed by the angle at which the wheels F F′ are placed to the axis of the mandrel. To vary this angle the mandrel may be secured to the frame or standard A by means of bolts working in curved slots upon the shoulder of the mandrel, in a manner which would readily suggest itself to any skilled mechanic, whereby said mandrel could be adjusted to any required angle; or the sleeves above mentioned may be bored at suitable angles, as indicated in dotted lines in Fig. 5, and by using different sets of sleeves any required pitch may be obtained for the corrugation.

It is apparent that by reversing the angle of the wheels F F′ and a movement of the gearing a left-hand spiral may be run upon the tube, while the shape of the corrugations may be varied at will by varying the form of the dies.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a machine for spirally corrugating metal tubes, the combination of a standard with arms projecting therefrom, one of said arms forming a mandrel, and the two constituting bearings through which shafts are run, on the outer ends of which are placed revolving dies the plane of revolution of which is oblique to the axis of said mandrel, and the whole being so adjusted as to turn said tubing upon the mandrel and spirally corrugate the same, substantially as described.

2. A machine for spirally corrugating metal tubes, consisting, essentially, of rotating male and female dies revolving in the same plane, a mandrel for supporting said tubing, the axis of which is oblique to the plane of revolution of said wheels, and a lever and eccentric or its equivalent for separating and pressing said dies together, for the uses and purposes substantially as described.

3. A machine for spirally corrugating metal

tubes, consisting, essentially, of rotating male and female dies, adapted to revolve in the same plane, a mandrel for supporting said tubing the axis of which is oblique to the plane of revolution of said wheels, and adjustable sleeves for enlarging the diameter of said mandrel, substantially as described.

4. In a machine for spirally corrugating metal tubes, the combination of male and female dies, adapted to revolve in the same plane, a suitable mandrel the axis of which is oblique to said plane of revolution, and shafting for revolving said wheels, one of which is provided with a ball-shaped bearing for the axis of its wheel, and a plate with rigid pins projecting into holes near the periphery of said wheel, and spiral springs for holding the latter in a like plane with its fellow, substantially as described.

FRANK R. GROUT.

Witnesses:
D. H. FLETCHER,
W. G. RAINEY.