

(No Model.)

3 Sheets—Sheet 1.

F. A. JUERGENS.

METHOD OF AND MACHINE FOR MAKING SHEET METAL TUBES.

No. 523,073.

Patented July 17, 1894.

Fig. 2.

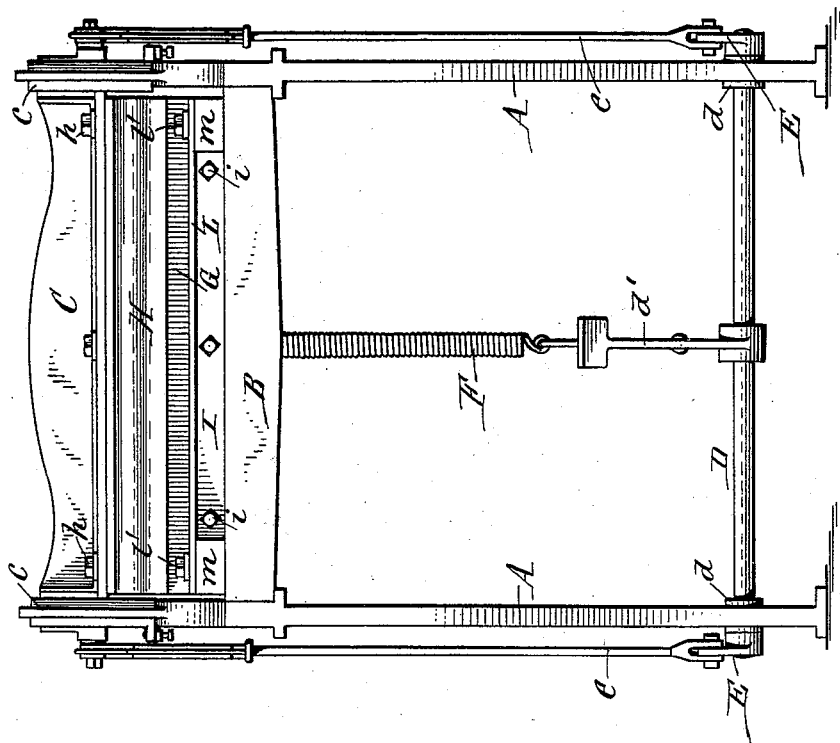
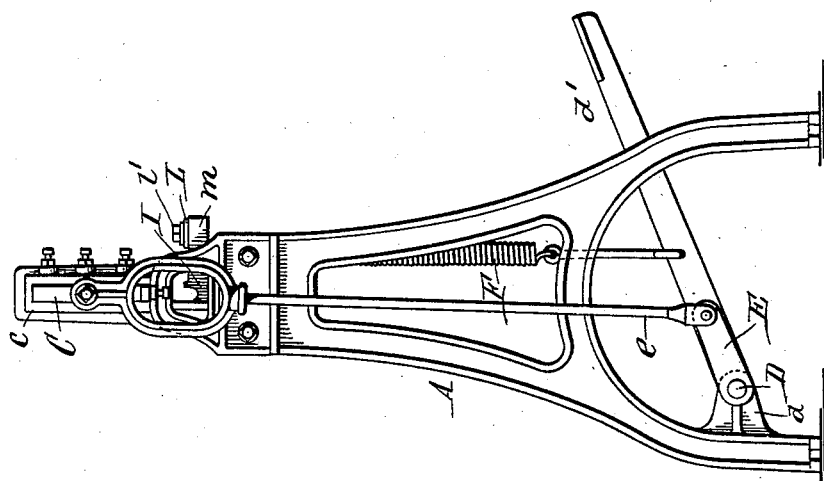


Fig. 1.



Witnesses:
Theo. L. Popp.
Emil Neuhart.

F. A. Juergens Inventor.
By William H. Pomeroy
Attorneys

(No Model.)

3 Sheets—Sheet 2.

F. A. JUERGENS.

METHOD OF AND MACHINE FOR MAKING SHEET METAL TUBES.

No. 523,073.

Patented July 17, 1894.

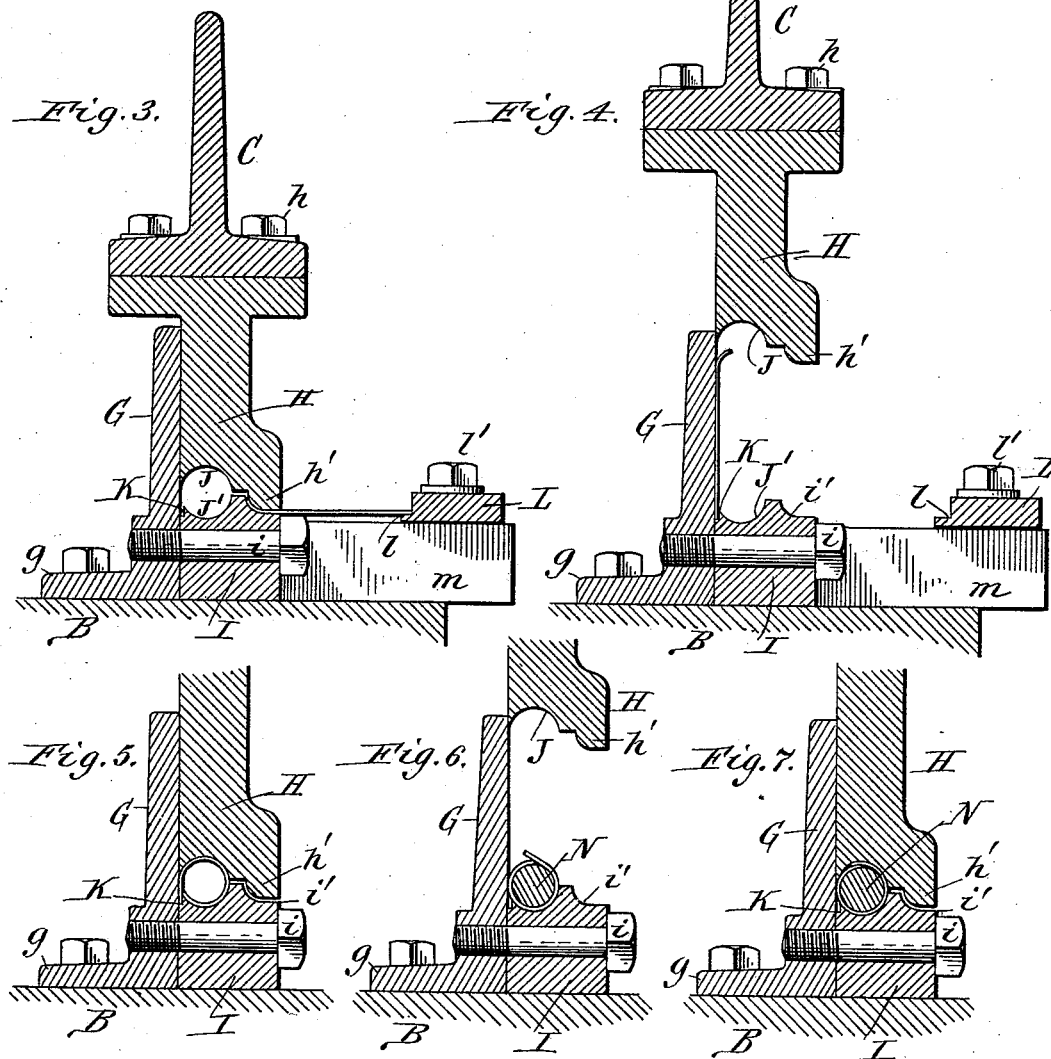


Fig. 8.



Witnesses:
Thos. L. Popp.
Emil Neuhart.

F. A. Juergens Inventor.
By Wilhelm Prount
Attorneys.

(No Model.)

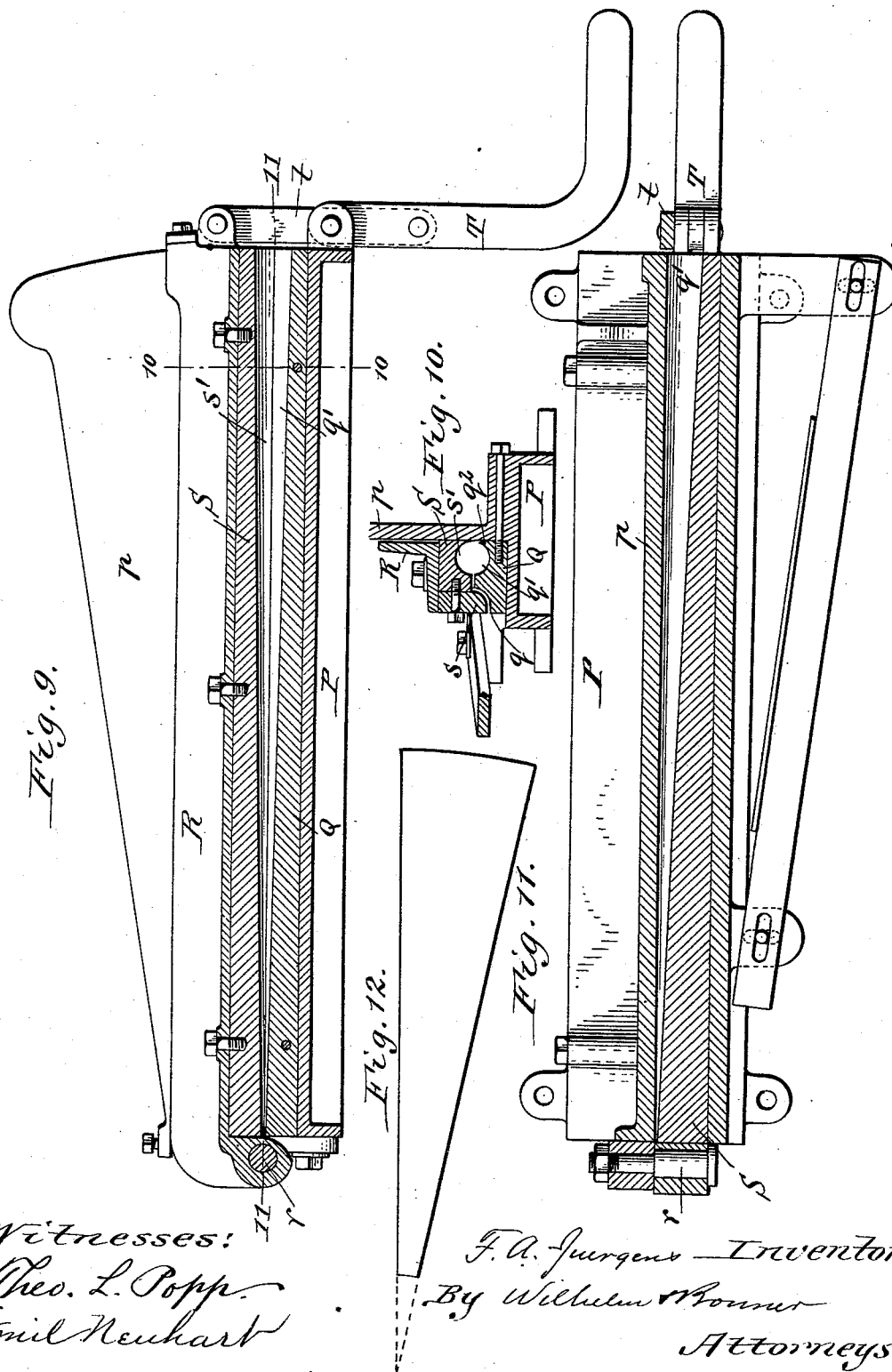
3 Sheets—Sheet 3.

F. A. JUERGENS.

METHOD OF AND MACHINE FOR MAKING SHEET METAL TUBES.

No. 523,073.

Patented July 17, 1894.



Witnesses:
Theo. L. Popp.
Emil Neuhart

F. A. Juergens Inventor.
By Wilhelm Wronner
Attorneys.

UNITED STATES PATENT OFFICE.

FREDERICK A. JUERGENS, OF BUFFALO, NEW YORK, ASSIGNOR TO THE
NIAGARA STAMPING AND TOOL COMPANY, OF SAME PLACE.

METHOD OF AND MACHINE FOR MAKING SHEET-METAL TUBES.

SPECIFICATION forming part of Letters Patent No. 523,073, dated July 17, 1894.

Application filed March 16, 1894. Serial No. 503,850. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK A. JUERGENS, a citizen of the United States, residing at the city of Buffalo, county of Erie, and State of New York, have invented a new and useful Improvement in Methods of and Machines for Making Sheet-Metal Tubes, of which the following is a specification.

This invention relates to a method of and machine for making round tubes of sheet metal, and has the object to produce a machine whereby practically perfect tubes can be manufactured cheaply and expeditiously.

In the accompanying drawings consisting of three sheets: Figure 1 is a side elevation of a machine containing my invention and adapted for forming cylindrical tubes. Fig. 2 is a front elevation thereof. Figs. 3, 4, 5, 6 and 7 are fragmentary cross sections of the die, punch and connecting parts, illustrating the principal operations in forming a cylindrical tube. Fig. 8 is an end view of a tube which has been partly formed by slightly modified means. Fig. 9 is a vertical longitudinal section of a machine embodying my invention and adapted to form taper tubes. Fig. 10 is a vertical cross section thereof in line 10—10, Fig. 9. Fig. 11 is a horizontal section in line 11—11, Fig. 9. Fig. 12 is a view of a blank for making a taper tube.

Like letters of reference refer to like parts in the several figures.

The main frame of the machine for making cylindrical tubes, shown in Figs. 1 to 7, consists essentially of two side frames A A and a table B connecting the side frames. C represents a vertically movable cross head arranged above the table and guided with its ends in ways c c formed in the upper portions of the side frames. D represents a rock shaft journaled in bearings d on the lower portions of the side frames and provided at its center with a treadle d' and at its ends with rock arms E E. The free ends of the latter are connected with the ends of the cross head by connecting rods e e, whereby the movement of the treadle is transmitted to the cross head. The cross head is normally held in an

elevated position by a spring F secured with its ends to the treadle and the table. All of these parts may be constructed and combined in any ordinary or suitable manner.

G represents the vertical back plate or back support of the die I, arranged upon the table and provided with a horizontal flange g which is secured to the table. The die I is arranged on the table and secured to the front side of the back plate by bolts i.

H represents the punch which is secured to the under side of the cross head by bolts h and moves contiguous to the vertical front face of the back plate. The face of the die is provided at its front end with a groove i' which is adapted to receive a rib h', on the face of the punch for effecting a primary bending of the front edge of the blank from which the tube is to be formed. The faces of the primary bending groove i' and rib h' are curved and preferably approximate a quadrant.

J J' are curling grooves formed respectively in the faces of the punch and die and whereby the body of the blank is curled into tubular form. These curling grooves are of semi-circular form, or nearly so, and are arranged in the rear of the primary bending groove and rib.

K represents a holding groove which receives the rear or lower edge of the blank for holding the same in position preparatory to effecting the curling operation. This holding groove is formed in the face of the die between the lower curling groove and the back plate and is equal in width to the thickness of the blank.

The upper curling groove is arranged vertically in line with the lower curling groove and its rear edge terminates flush with the face of the back plate, so that the punch upon descending will deflect the blank forwardly which has previously been placed against the face of the back plate.

L represents a guide or gage bar arranged in front of the die and provided with a ledge l on its rear side for supporting the rear edge of the blank during the primary bending of

its front end. The guide bar is secured with its ends, by bolts *V*, to forwardly projecting arms *m* formed on the die.

N represents a removable mandrel which is placed inside of the curled tube for effecting the finishing operation upon the tube.

The operation of forming a cylindrical tube is as follows: A rectangular sheet metal blank of the proper dimensions is placed with one edge upon the ledge of the guide bar and with its opposite edge, which may be called the front edge, in the bending groove or on the adjacent portion of the die. The punch is now lowered upon the die, whereby the front edge of the blank is bent upwardly in a curve, as represented in Fig. 3. The punch is then raised and the blank is placed in an upright position against the front side of the back support and with its edge into the holding groove of the die, so that the curved upper end of the blank projects forwardly, as represented in Fig. 4. The punch is again lowered, and during its descent the curling groove thereof engages with the upper curved end of the blank and curls the latter into tubular form, as represented in Fig. 5. When the curling of the tube has been completed the rear or lower end of the blank, which is seated in the holding groove, projects tangentially from the body portion of the tube. In order to bend this tangentially projecting ledge against the body of the tube, the cylindrical mandrel is next placed in the tube and the latter is turned in the curling groove of the die so that the projecting ledge of the blank is arranged uppermost, as represented in Fig. 6. Upon again lowering the punch the projecting ledge of the blank is pressed against the body of the tube, as shown in Fig. 7, thereby finishing the same. After the tube is finished the mandrel is removed therefrom. The tubes so formed are round and smooth, and this method and these devices permit the production of tubes which are very small in diameter, for instance speaking tubes and tubes which are used for inclosing electrical conductors, and they also permit the production of tube sections which are of great length.

If desired the primary bending of the front end of the blank may be dispensed with, in which case the front end of the blank tends to flatten upon curling the same, as shown at *o* in Fig. 8. This flattened portion, however, is rounded upon inserting the mandrel in the tube and bending down the rear end of the blank during the finishing operation, illustrated in Figs. 6 and 7.

My invention is also applicable for forming taper tubes. A machine suitable for this purpose is represented in Figs. 9 to 11. In these figures P represents a base provided with a vertical back plate *p*. Q represents the die arranged upon the base adjacent to the back plate and provided with a primary bending groove *q*, a lower curling groove *q'*, and a holding groove *q''*. R represents a rock

arm which is arranged in front of the back plate and pivoted upon one end of the base by a bolt *r*. S represents a punch secured to the under side of the rock arm and provided on its face with a primary bending rib *s*, and an upper curling groove *s'* which are adapted respectively to co-operate with the primary bending and curling grooves of the die. The punch is raised and lowered by means of a rock lever T pivoted on the base and connected with the free end of the rock arm by a link *t*. The sides of the grooves and rib of the punch and die converge longitudinally to a common point on the axis of the rock arm, so as to cause the blank to curl properly into taper form, the operations being the same as those described for making cylindrical tubes.

In making taper tubes the blank has the form of a segment, as shown in Fig. 12, and the mandrel is tapered to correspond with the form of the tube.

I claim as my invention—

1. The herein described method of forming a sheet metal tube from a flat blank which consists in bending up the front edge of the blank, then curling the blank between a punch and a die to give the blank an approximately round form and a projecting ledge, then inserting a mandrel into the curled blank, and then closing the projecting ledge against the tubular body of the blank, substantially as set forth.

2. The combination with a die provided with a curling groove and a holding groove arranged on one side of the curling groove and adapted to receive the edge of the blank, of a punch provided with a curling groove arranged over the curling and holding grooves of the die, substantially as set forth.

3. The combination with the die, of a back support arranged in rear of the die and having a face adapted to support the blank, and a punch arranged to slide upon the face of the back support, substantially as set forth.

4. The combination, with a back support, of a die arranged in front of said back support and provided with a curling groove and with a holding groove adjacent to said back support, and a punch arranged adjacent to the back support and provided with a curling groove, substantially as set forth.

5. The combination with the die provided in its face at its front end with a bending groove, a curling groove in rear of said bending groove, and a holding groove in rear of the curling groove, of a punch provided with a curling groove, and a bending rib adapted, respectively, to co-operate with the curling and bending groove of the die, substantially as set forth.

6. The combination, with the back support having a vertical face on its front side, of a die provided in its face at its front end with a bending groove, a curling groove in rear of said bending groove, and a holding groove

adjacent to the back support, and a punch arranged adjacent to the face of the back support and provided with a curling groove and a bending rib respectively adapted to co-operate with the curling and bending grooves of the die, and a guide bar arranged in front of the die, substantially as set forth.

Witness my hand this 6th day of March, 1894.

FREDERICK A. JUERGENS.

Witnesses:

GEO. A. LAUTZ,
THEO. L. POPP.