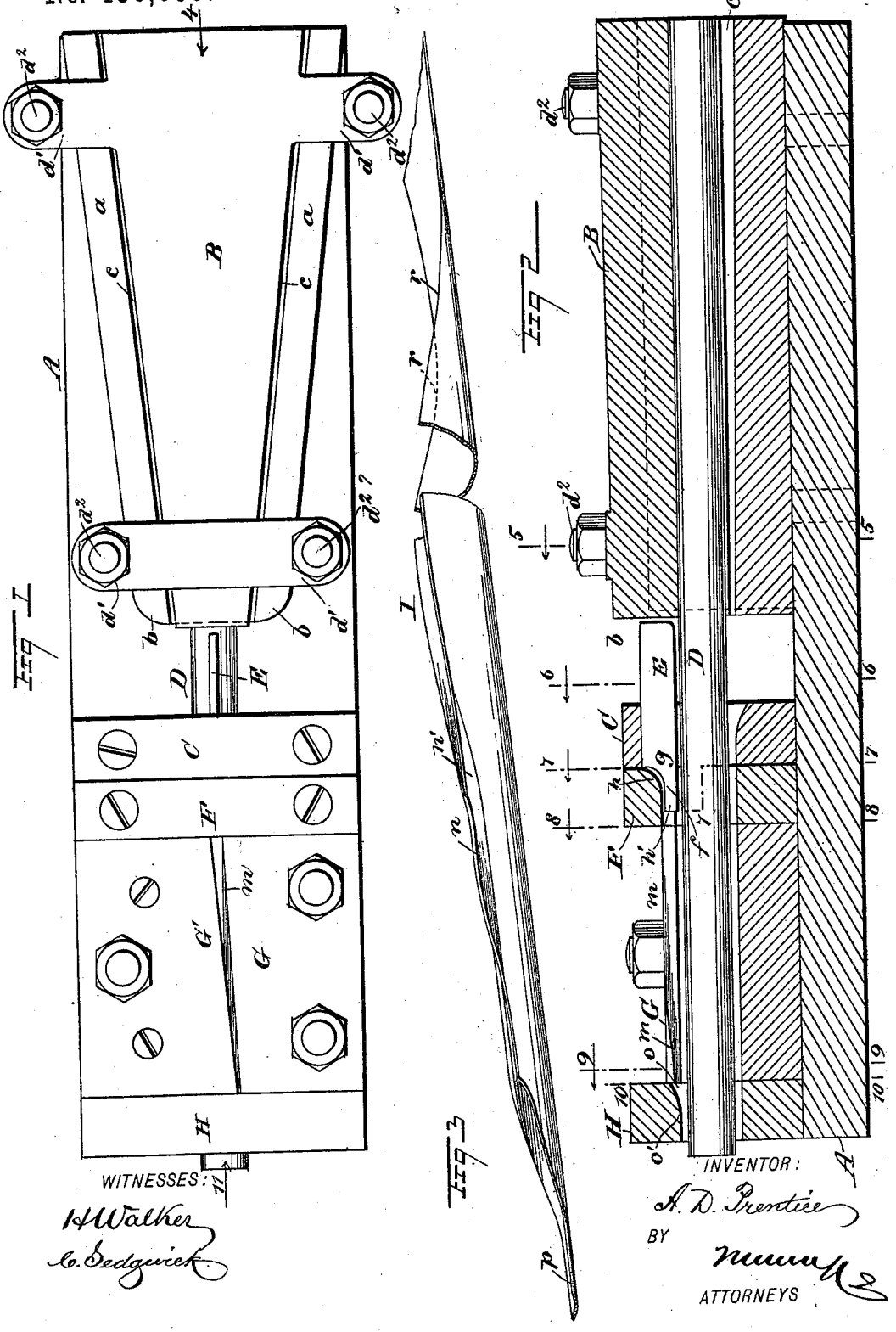
(No Model.) 2 Sheets—Sheet 1.

A. D. PRENTICE.

MACHINE FOR SEAMING TUBES.

No. 456,059. Patented July 14, 1891.



WITNESSES:
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(No Model.) 2 Sheets—Sheet 2.

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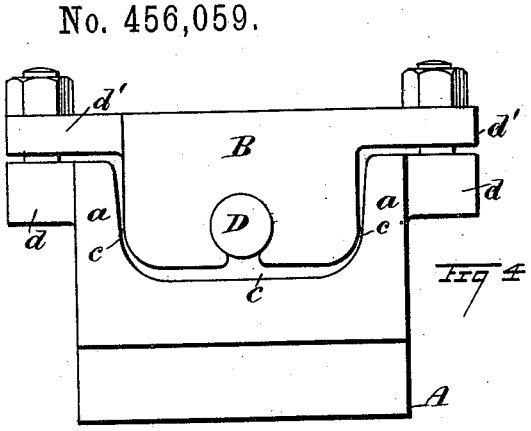

Fig 4

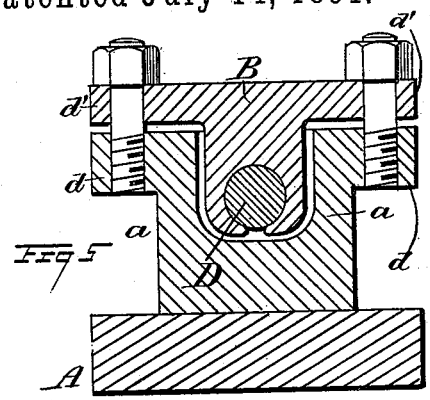

Fig 5

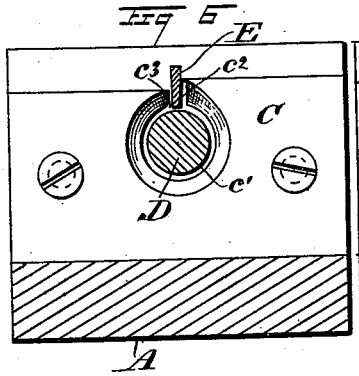

Fig 6

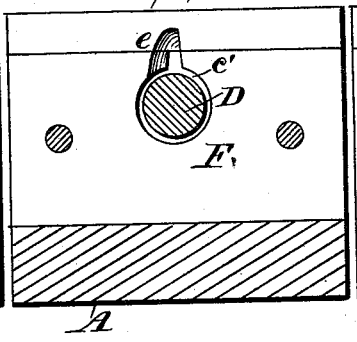

Fig 7

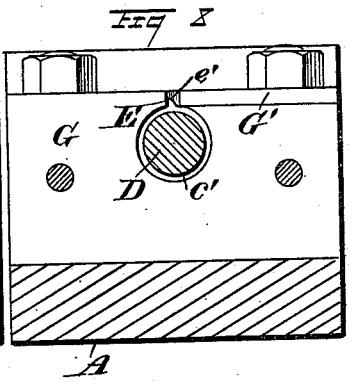

Fig 8

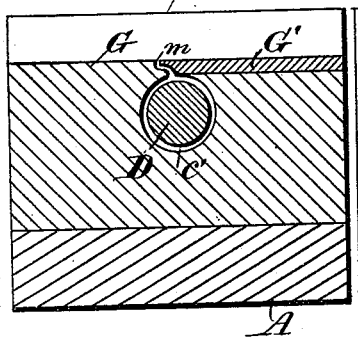

Fig 9

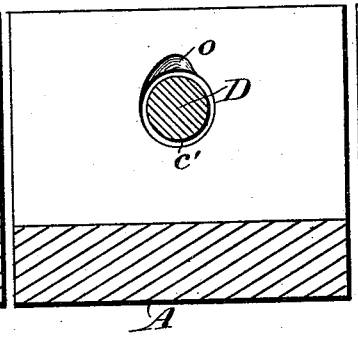

Fig 10

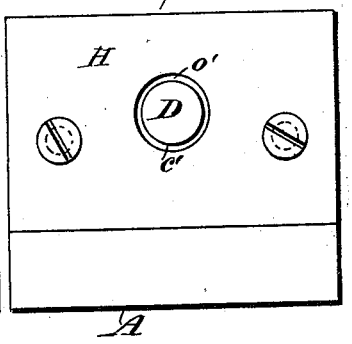

Fig 11

Fig 12

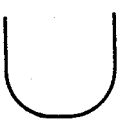

Fig 13

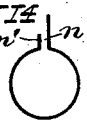

Fig 14

WITNESSES:

H. Walker

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Fig 15

Fig 16

INVENTOR:

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Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

ALBERT D. PRENTICE, OF NEW YORK, N. Y.

MACHINE FOR SEAMING TUBES.

SPECIFICATION forming part of Letters Patent No. 456,059, dated July 14, 1891.

Application filed April 8, 1891. Serial No. 388,128. (No model.)

To all whom it may concern:

Be it known that I, ALBERT D. PRENTICE, of New York, in the county and State of New York, have invented a new and useful Improvement in Machines for Seaming Tubes, of which the following is a full, clear, and exact description.

This invention relates to an improved device for forming a secure double-folded locked seam between the adjacent edges of a blank of sheet metal as the same is in progress of formation into a cylindrical or other shaped tube.

To this end my invention consists in the construction of parts, as hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters and numerals of reference indicate corresponding parts in all the figures.

Figure 1 is a plan view of the composite die, which is preferably employed to carry into effect the improved method of tube formation. Fig. 2 is a longitudinal central section. Fig. 3 is a blank of sheet metal removed, broken at one end and intermediately of the ends, showing the successive changes effected in the shape of the blank as it is drawn through the die. Fig. 4 is an end view of the forming-die, taken opposite the arrow 4 in Fig. 1. Fig. 5 is a cross-section of the forming-die, taken on the line 5 5 in Fig. 2. Fig. 6 is a transverse section on the line 6 6 in Fig. 2. Fig. 7 is a transverse section on the broken line 7 7 in the same figure as the last section named. Fig. 8 indicates a cross-section on the line 8 8 in Fig. 2. Fig. 9 is a transverse section on the line 9 9 in Fig. 2. Fig. 10 is a cross-section on the line 10 10. (See Fig. 2.) Fig. 11 is an end elevation of the forming-die opposite the arrow 11 in Fig. 1. Fig. 12 indicates an end view of the flat sheet-metal blank from which a tube is to be formed. Fig. 13 represents the first stage of the bending operation effected by drawing the blank in the die from the end at arrow 4 toward the arrow 11. Fig. 13 shows the form assumed by the blank when it has reached a portion of the die indicated by section 5 in the drawings. Fig. 14 indicates the progressive bending of the blank when it reaches the section of the die defined by the cross-line 6 6 in Fig. 6. Fig. 15 represents the shape assumed by the tube-blank when it has been drawn through the forming-die slightly past the section-line 9 9 thereon, and Fig. 16 shows the cross-section of the tube completed as it issues from the die at the end 11.

The base-piece A of the die-block is formed from metal, preferably rectangular on its edges, and given a proper thickness for its service, which is to support and retain other parts of the die in proper relative position.

At the receiving end of the composite die (indicated by arrow 4) a throat is formed by the erection of two walls *a*, which are of proper length for efficient service, and converge regularly toward their inner terminals *b*, thus producing a wedge-shaped passage *c* between said walls that is of correct dimensions to suit the size of the sheet-metal blank to be formed therein. The corners below in the channel *c* are rounded, as indicated in Figs. 4 and 5, and upon the upper edges of the die-walls *a* there are laterally-extended ears *d*, formed at four or more points, as may be necessary to retain in place a male-forming die-piece B, which corresponds in shape to that of the channel *c*, having less width, so as to allow a space to intervene between its bottom face and sides and those of the receiving-die piece produced by the converging walls before mentioned, the inserted die-piece B having ears *d'*, that mate with the ears *d*, and are thereto secured by screw bolts or studs and nuts, as shown at d^2 in Figs. 1, 2, 4, and 5, so that a U-shaped tapering channel is thus produced for the insertion of a sheet-metal blank.

In Figs. 1 and 2 it will be seen that a contracting die-block C is located transversely of the base-piece A, near the inner ends *b* of the walls *a*, and, as indicated in Fig. 6, said block is perforated to receive a longitudinally-extended cylindrical mandrel D, which is secured at the center of width in the male-die piece B near its lower face and parallel thereto, which mandrel is of sufficient length to project slightly beyond the end of the composite die, as indicated in Fig. 1 by arrow 11. The circular aperture *c'* in the die-block C is made flaring toward the converging die-block B, so as to permit the free entrance of an end portion of a sheet-metal blank that has been drawn through the "converging-channel die," as the first-described die is named.

Above the mandrel D a tongue E is secured

in the die-block C, so as to nearly impinge on it with its lower edge, said tongue having its sides flat and parallel and its edges similarly disposed and located in a plane coincident with that of the axis of the mandrel extends to a point near to the converging channel-die *a* B. Inspection of the die-block C, as shown in Fig. 6, indicates that there is an annular passage *c'*, extending around the mandrel D, as previously mentioned, and, furthermore, that this passage is upwardly-extended, as at c^2, on one side of the tongue E, about double the distance of the similar extension formed at c^3 on the opposite side of the tongue.

Adjacent to the contracting and curving die C a similar die F is secured across the base A, and into the circular receiving end of the die F (shown in Fig. 7) the tongue E has its end portion *f* inserted, said end portion being suitably reduced in vertical width on the upper edge and curved, as at *g*, (see Fig. 2,) a space intervening between this edge and the rounded edge *h* of the die F, which is also cut away to form an open recess above, as shown at *e* in Fig. 7, said recess being produced on the side whereon the low channel c^3 is provided, the corner of the tongue being removed, as at *e'* in Fig. 8, to allow the sheet-metal flange to fold over it.

From the terminal *h'* of the tongue E toward the end 11 of the mandrel D a slit *m* is produced in the remaining portion of the die-block F, and also between the adjacent edges of the two flange-turning dies G G', that are mounted upon and secured to the base-piece A as extensions of the die-block F, said slit being so shaped that a flange *n*, (see Fig. 14,) drawn through it from the die-block F toward the die-block H, will be turned over the edge of a lower flange *n'* and assume the relative folded connection indicated at Fig. 15, the shapes of the slitted passage and twist given to it being shown in Figs. 9 and 10.

The terminal die-block H, through which the formed and seamed tube is drawn, has an annular channel *c'* allowed to remain between the inner cylindrical surface of the same and the concentrically-held mandrel D, the receiving side of said die-block being shown in Fig. 10, wherein it will be seen that an elliptically-curved flare *o* is produced on the upper side at the edge, which contracts as the block is entered, until at *o'* (see Fig. 2) the annular channel *c'* becomes uniform in width around the mandrel.

The tube-blank I (shown flat in Fig. 12 and in different stages of formation in Fig. 3) is normally a rectangular strip of sheet metal of proper width having parallel side edges, and provided with a tang *p* at one end, which should be of sufficient length to pass through the composite die and project at the end 11 of said die, so as to be gripped by a pair of drawing-tongs, it being understood that the die is to be secured to and used on an ordinary drawing-table and adjuncts therefor, which, being in common use, are not shown. When the blank is drawn upon toward end 11 of the composite-die, the edges of the plate of metal are first curved slightly upward in the same direction, as at *r* in Fig. 3, the degree of curvature increasing until the point indicated by section 5 is reached, when the plate will be curved, as represented in Fig. 13. The further longitudinal movement of the blank I toward arrow 11 will have bent the plate into a cylindrical form and produced a high flange *n* and a low flange *n'* thereon, such a conformation resulting when the section 8 has been reached. The flanges *n' n* are now entered within the slit *m*, which, by its gradual twist from a vertical to a horizontal plane where the die H is entered, folds the high flange *n* upon the low flange *n'* and around it, as shown in Fig. 15, the passage of the closed tube I through the finishing-die H serving to double fold the flanges and produce a close seam on the tube, which may be compacted by a proper proportion of parts, so as to render the joint tight and cause it to assume the form shown in Fig. 16.

It is evident that by a manifest change in the shape of the dies *a* B, mandrel D, and dies C F H, as well as the dies G G' in cross-section, the tubes drawn may be made square, hexagonal, or oval, if preferred.

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

1. A composite die to form tubes of sheet metal and double-fold seam them, consisting of a base-piece, a converging channel-die thereon which commences the bending, a contracting-die that shapes the tube and flanges it, a tongue in this die, two flange-bending dies, a finishing-die, all arranged to receive the blank consecutively, and a mandrel longitudinally extended through the several dies, substantially as described.

2. In a composite die for tube formation, the combination, with a base-piece, of a converging channel-die thereon having a cylindrical mandrel longitudinally affixed therein, which is concentric within succeeding dies, a contracting-die which forms the tube and produces a high and a low flange on meeting-edge portions of a sheet-metal blank that is entered at the outer end of the converging die, a tongue affixed in the contracting-die above the mandrel, two flange-bending dies succeeding the contracting-die that turns the flanged edges into hooked connection with each other, and a finishing-die which double folds the flanges and compresses the seam thus produced on the finished tube, substantially as described.

ALBERT D. PRENTICE.

Witnesses:
WM. P. PATTON,
E. M. CLARK.