(No Model.) 2 Sheets—Sheet 1.

E. SMALL.

MACHINE FOR FORMING SHEET METAL CYLINDERS.

No. 509,959. Patented Dec. 5, 1893.

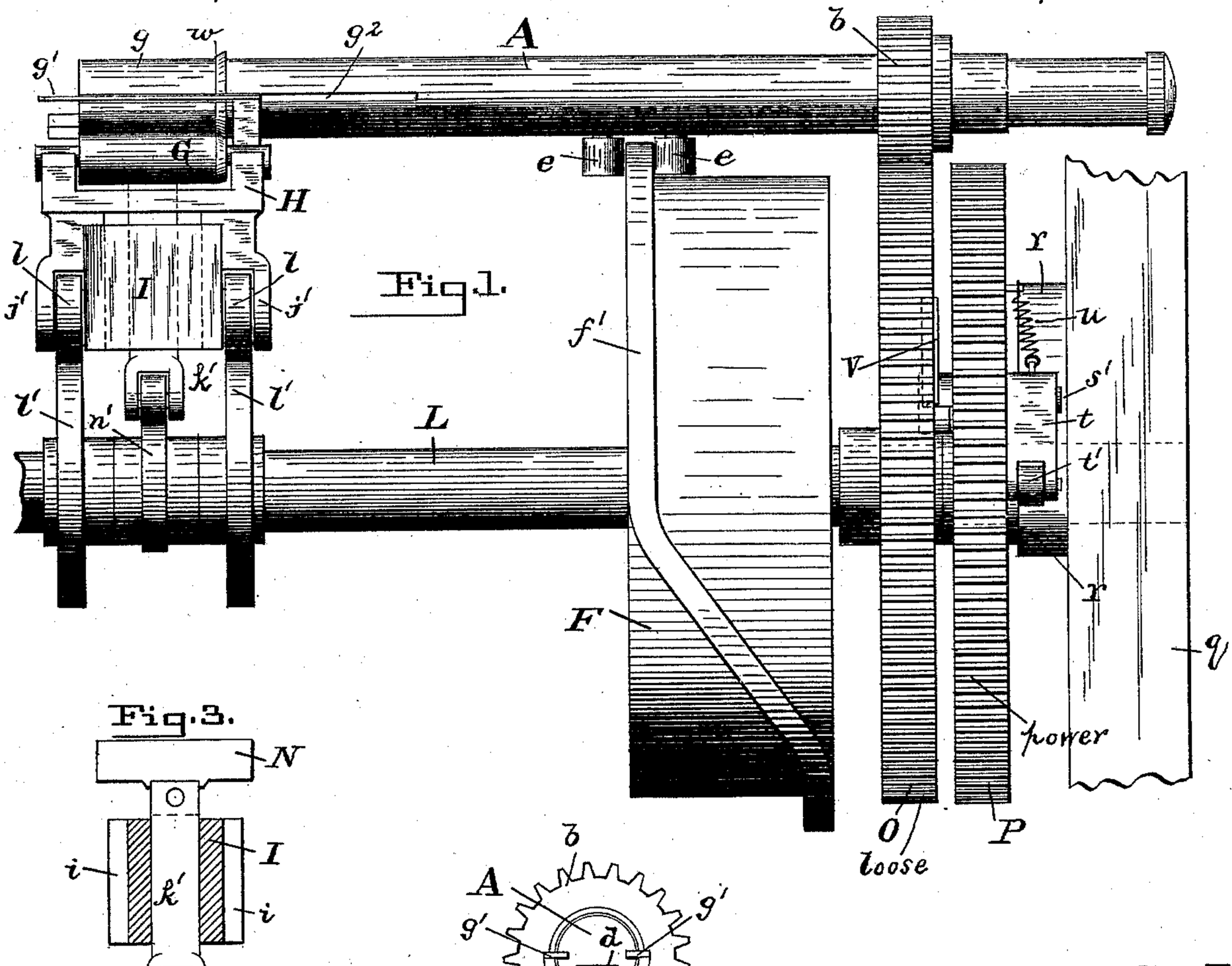


Fig. 1.

Fig. 3.

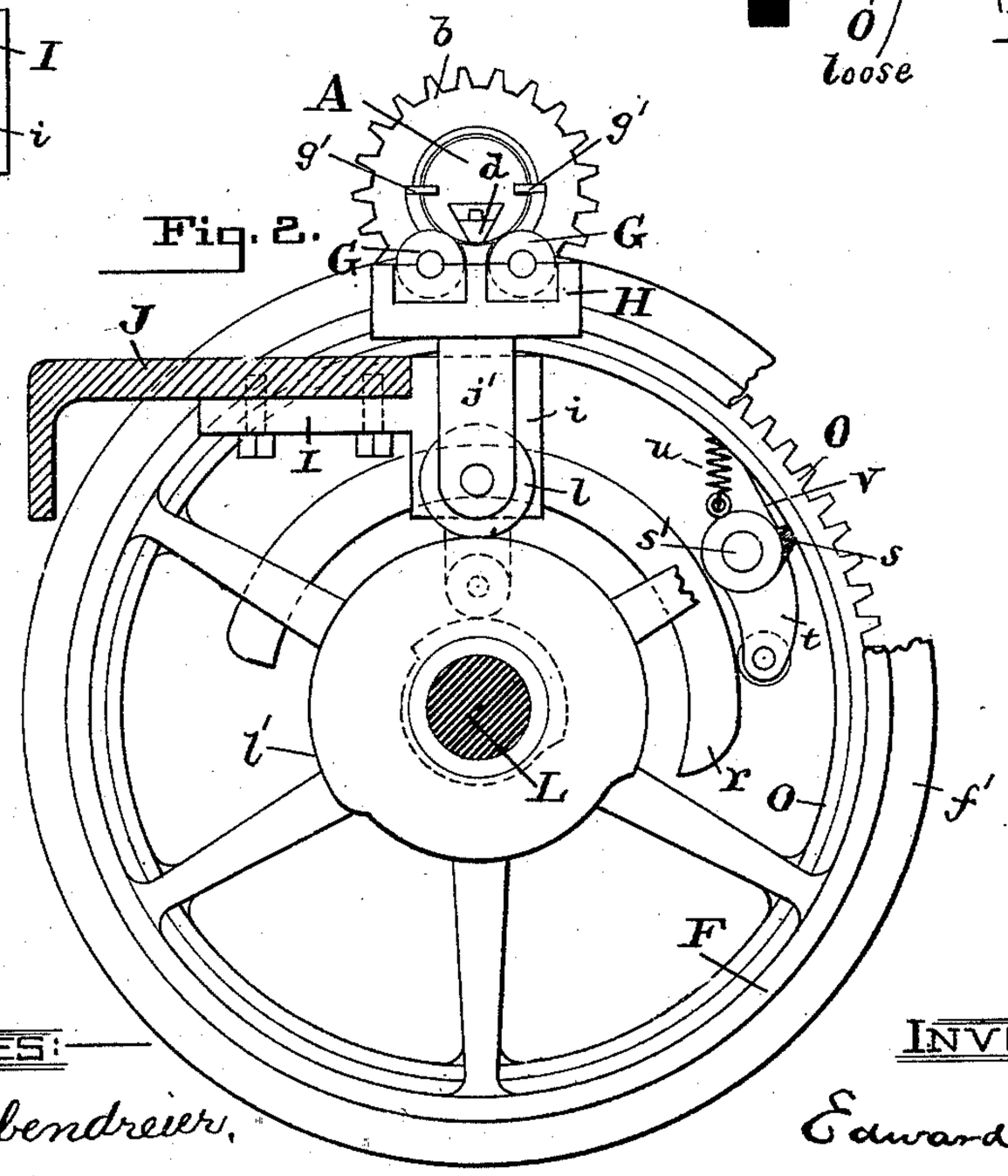


Fig. 2.

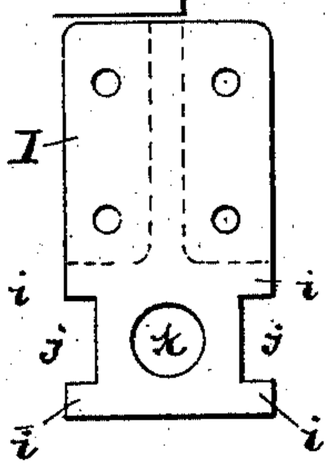


Fig. 4.

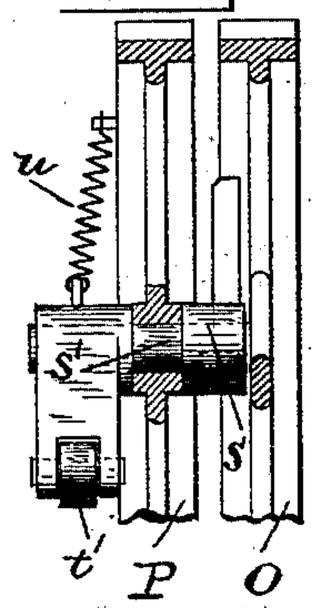


Fig. 5.

WITNESSES:

A. O. Babendreier.

L. Parker Davis.

INVENTOR:

Edward Small

By Chas B. Mann

ATTORNEY.

THE NATIONAL LITHOGRAPHING COMPANY.
WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

E. SMALL.

MACHINE FOR FORMING SHEET METAL CYLINDERS.

No. 509,959. Patented Dec. 5, 1893.

Fig. 6.

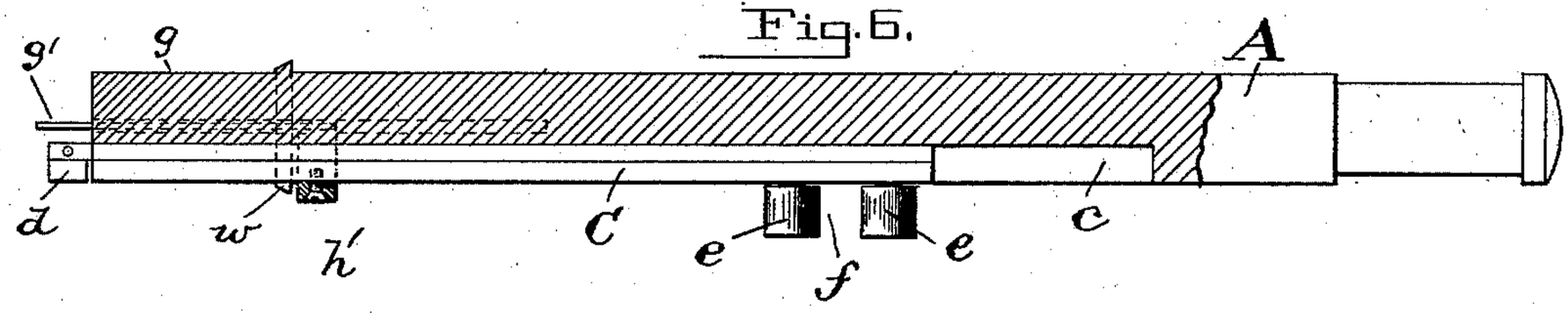


Fig. 7.

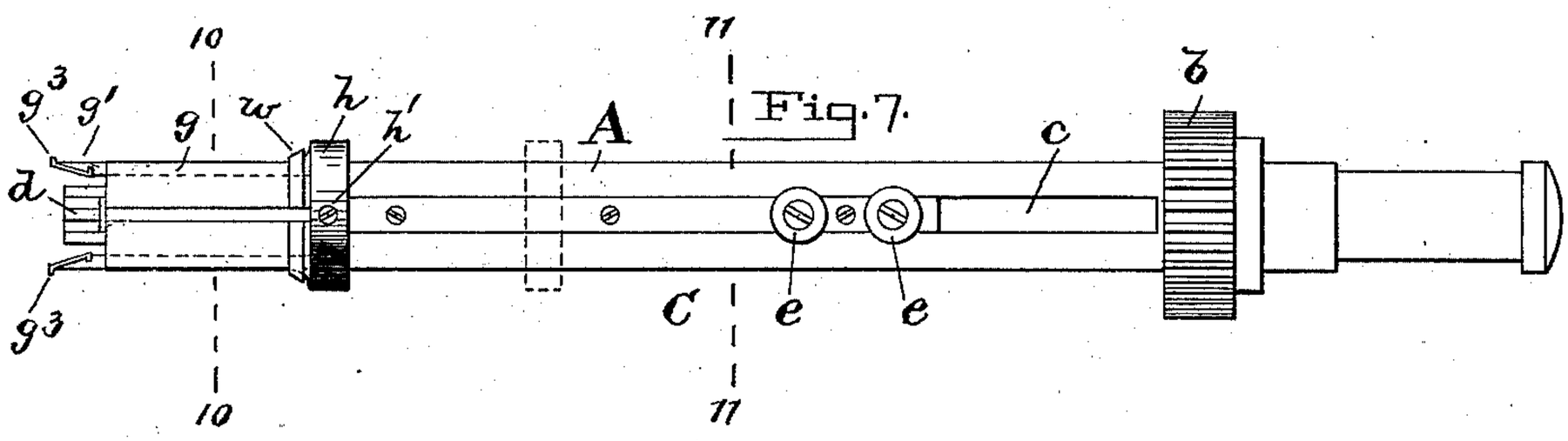


Fig. 8.

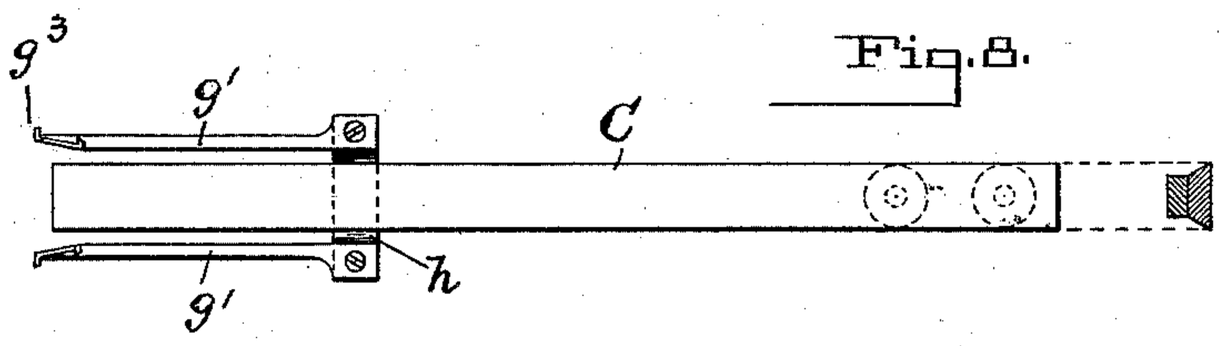


Fig. 9.

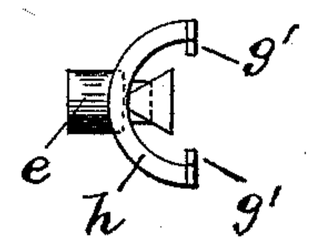


Fig. 10.

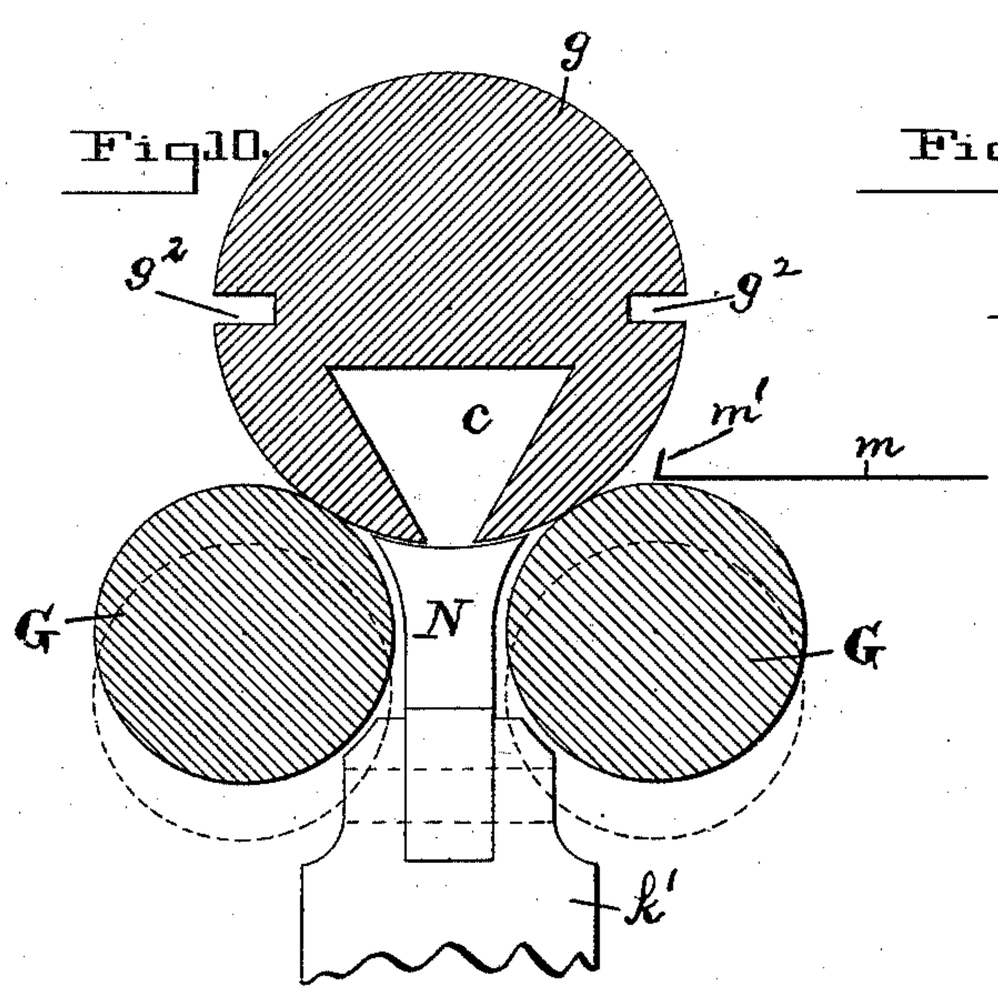
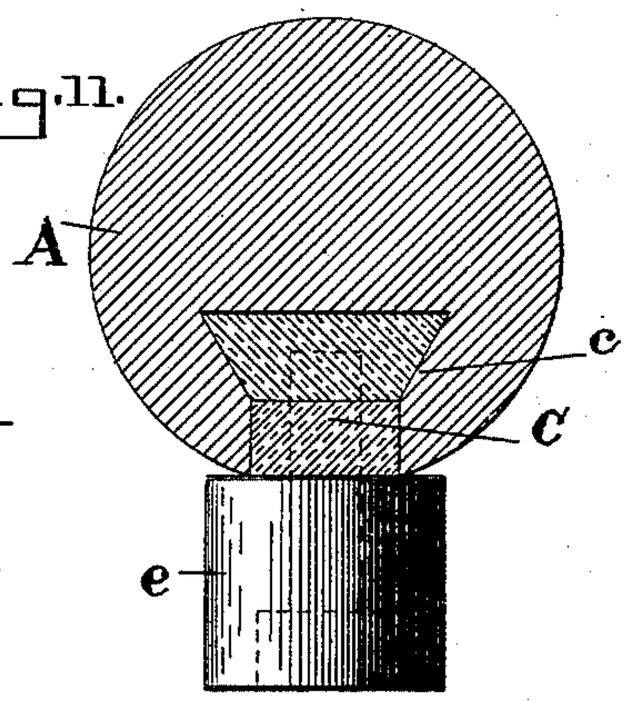


Fig. 11.



WITNESSES:

A. O. Babendreier.

F. Parker Davis.

INVENTOR:

Edward Small

By Chas B. Mann

ATTORNEY.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDWARD SMALL, OF BALTIMORE, MARYLAND.

MACHINE FOR FORMING SHEET-METAL CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 509,959, dated December 5, 1893.

Application filed February 20, 1892. Renewed April 28, 1893. Serial No. 472,279. (No model.)

To all whom it may concern:

Be it known that I, EDWARD SMALL, a citizen of the United States, residing at Baltimore city, in the State of Maryland, have invented certain new and useful Improvements in Machines for Forming Sheet-Metal Cylinders, of which the following is a specification.

My invention relates to a mandrel and tool for forming and seaming sheet-metal cylinders or bodies of other shapes, the object being to provide for taking a flat blank and first forming it into a cylinder, and then while the cylinder is still on the mandrel seaming it longitudinally, all as hereinafter set forth.

The invention is illustrated in the accompanying drawings in which—

Figure 1 is a side view of the mandrel and the mechanism immediately connected with it. Fig. 2 is an end elevation of the same parts. Fig. 3 is a view of the seam-stay and a section of the guide therefor. Fig. 4 is a top view of the bracket which supports the guide. Fig. 5 is a section view showing part of the drive-wheels and intermittent gear. Fig. 6 is a longitudinal section of the mandrel. Fig. 7 is a side view of the mandrel. Figs. 8 and 9 are side and end views, respectively, of the tool-bar and push-springs. Fig. 10 is a cross-section of the mandrel and the rollers, and a side view of the seam-stay, all of these parts being in the position they occupy when the seaming tool is at work on the sheet-metal cylinder. Fig. 11 is a cross-section of the mandrel at line 11—11.

The letter, A, designates the mandrel which is to be suitably mounted in ordinary bearings (not shown here because well-known to mechanics) which will support it and allow it to turn.

The mandrel has a pinion, *b*, by which it is turned and is provided with a longitudinal groove, *c*, which is occupied by the tool-bar, C. This tool-bar carries the seaming-tool, *d*, which is shown, described and claimed in Letters-Patent of the United States No. 355,108, granted me December 28, 1886; a full description here of the seaming-tool is therefore unnecessary. As described in the patent referred to and as contemplated here, the longitudinal seam is formed on the inner side of the sheet-metal cylinder. My present invention, however, is not limited to a mandrel and tool for forming an inner-side seam, as my combination may form a seam outside. The tool-bar, C, fits in the mandrel-groove, *c*, and is movable back and forth endwise therein; in order that this reciprocating movement may be imparted to the tool-bar, it is provided on one side with two friction rollers, *e*, which are separated from each other by a space, *f*, to receive the flange, *f'*, of a cam-wheel, F. While the mandrel, A, and tool-bar, C, have an intermittent rotary movement, as hereinafter explained, the tool-bar, C, also has a reciprocating movement. The sheet-metal cylinder that is to be formed, will be wrapped around the end, *g*, of the mandrel, seen at the left-hand side in the drawings. The tool-bar, C, has push-springs, *g'*, which may be attached by one end in any suitable way: these springs, in the present instance are straight-bars and are attached first to a semi-circular collar, *h*, large enough to fit half way about the mandrel and which is made fast to the tool-bar by a screw, *h'*, or any other suitable means. In the present instance two push-springs, *g'*, are employed and are deemed sufficient though more than two may be used; the said springs, *g'*, extend parallel with the tool-bar and their free-ends are yielding, and each spring occupies a straight groove, g^2, formed in the side of the mandrel, A, and is flush with the outer surface thereof. When the tool-bar, C, is retracted or drawn back toward the right-hand, from the position it occupies in the drawing, the free extremities, g^3, of the push-springs will be released from the sheet-metal body and will spring outward and then the catch on each extremity will bear on the end of the sheet-metal cylinder which may be about the forming-end, *g*, of the mandrel, and then when the tool-bar, C, is moved forward toward the left-hand, these spring-catches will push the said cylinder endwise off the mandrel.

Two rollers, G, are employed in connection with the mandrel-end, *g*, to form the flat sheet-metal blanks into cylinders. These rollers have their journaled ends resting in bearings in a vertically-movable frame, H, and have position below the mandrel-end, *g*, (the roller-frame, H, is guided by a bracket, I,) which is secured to a table or other suitable stationary support, J. The said bracket, I, has four flanges, *i*, which form two vertical

grooves, *j*, on opposite sides; it also has a central hole or bore, *k*, between the two grooves. The roller-frame, H, has two legs, *j'*, which fit and work up-and-down in the vertical grooves, *j*, of the bracket; each leg has a friction-roller, *l*, and two cams, *l'*, are mounted on a shaft, L, and each cam bears against a different one of the said friction rollers; when the shaft revolves the cams, *l'*, have the effect to raise and lower the roller-frame, H. When the two rollers, G, are raised so as to be close to or in contact with the mandrel-end, *g*, as shown in Fig. 10, a flat sheet-metal blank, *m*, may be inserted between the said rollers and mandrel and thereby formed into a cylinder which will wrap or coil about the said mandrel. The flat blank, *m*, has at each of two opposite ends an upturned edge, *m'*, and when this blank has been wrapped about the mandrel and thereby forms a cylinder, the said two up-turned edges are curled or coiled together on the inner side of the said cylinder, by the action of the reciprocating seaming-tool, *d*; the up-turned edges of the blank, therefore, are formed into the seam of the sheet-metal cylinder. The operation of the seaming-tool, *d*, in forming the seam, is fully described in the Letters-Patent heretofore mentioned.

The sheet-metal blanks are fed to the machine and inserted, as follows: The flat blanks, *m*, are presented, with one of the upturned edges foremost, to a position between the mandrel, A, and one of the rollers, G; if no sheet-metal cylinder is on the mandrel, the said foremost upturned edge may be gently pressed against the revolving mandrel, and so held until, by the revolution of the mandrel, the longitudinal groove, *c*, takes the said upturned edge in, whereupon the sheet-metal blank will be drawn between the mandrel and rollers and at once wrapped about the mandrel, bringing the said upturned edges close together and pointing them inward. The tool, *d*, then reciprocates and coils the said two edges of the sheet-metal into a seam. By lowering the two rollers, G, from the mandrel, the sheet-metal cylinder about the mandrel may be pushed off. A seam-stay bar, N, is employed to press longitudinally against the exterior of the sheet-metal cylinder, while the latter is on the mandrel-end, *g*, and by such exterior pressure sustain the seam-parts of the cylinder while the seaming-tool, *d*, is at work on the inner side of the cylinder. It will be observed that the pressing face of the seam-stay bar is wider than the longitudinal groove in the mandrel and presses the sheet-metal cylinder on each side of the seam and groove against the mandrel, and thereby prevents any slipping or yielding of the seam-parts during the seaming operation. The seam-stay, N, is mounted on the upper end of a shank or rod, *k'*, which passes freely through the roller frame, H, and also through the central bore, *k*, in the bracket, I, which latter serves as a guide; the seam-stay is vertically-movable independent of the roller-frame, H. The lower end of the seam-stay shank, *k'*, has a friction-roller, *n*, against which bears a cam, *n'*, mounted on the shaft, L, between the two roller-cams, *l'*. The cam, *n'*, is so shaped and placed on the shaft, as to raise the seam-stay, N, at a particular juncture, to wit; just after a sheet-metal blank, *m*, has been wrapped about the mandrel-end, *g*, and during one of the intermissions or pauses in the revolution of the mandrel, at which time, also, the tool-bar, C, and tool, *d*, when arranged as shown in the drawings, moves from left to right. The cam-wheel, F, is keyed fast to the shaft, L, and, as already stated, imparts a reciprocating movement to the tool-bar, C. The gear-wheel, O, is loose on the shaft, L, and gears with the pinion, *b*, on the mandrel; a second gear-wheel, P, is keyed fast to the shaft, L, alongside of the loose wheel, O, and constitutes the driver; it receives motion from another wheel not shown. Any suitable mechanism that is known to mechanics for producing an intermittent rotary movement of the mandrel may be employed. Such mechanism connects the loose wheel, O, and the fast wheel, P. The shaft, L, has bearing in a stationary standard, *q*, to which also a cam-plate, *r*, is secured. The fast wheel, P, carries a pawl, *s*, on a rock-shaft, *s'*; the pawl is at the side of the fast-wheel, P, which adjoins the loose-wheel, O, and its position takes close to the rim of said loose wheel. An arm, *t*, is on the pawl-shaft, *s'*. At the other side of the fast-wheel this arm has a friction roller, *t'*, and its position is such that its path of rotation brings it against the stationary cam-plate, *r*. The loose-wheel, O, has on the inner side of its rim adjoining the fast wheel, P, a lug, V. A spiral spring, *u*, connects the pawl-arm, *t*, with the rim of the fast-wheel, P, and normally has the effect to turn the said arm to a radial position where the pawl, *s*, would not engage with the lug, *v*, on the loose-wheel; at such times the loose-wheel, O, will not revolve and the mandrel, A, will be at a stand-still. But when by the revolution of the fast-wheel, the pawl-arm, *t*, comes in contact with the cam-plate, *r*, as in Figs. 1 and 2, the effect of the said cam-plate is to turn the pawl-arm and bring the pawl, *s*, where it will engage with the lug, *v*. When thus engaged the loose-wheel, O, will revolve and so will the mandrel. In the present instance the mandrel-end, *g*, has a beveled ring or annular flange, *w*, and the rollers, G, have a corresponding bevel on one end. This device is to form on the end of the sheet-metal cylinder, a flare or outward flange to which a bottom may be readily attached for making cams.

It will be obvious to a mechanic skilled in this class of machines that the construction of many of the parts here shown and described may be modified and changed from the way they are illustrated in the drawings, without departing from my invention. I do

not, therefore, limit my claims to the construction shown.

It will be obvious that the shape of the mandrel is not limited to the cylindrical shape shown, as sheet-metal bodies other than those which are "cylindric" may be made by this mechanism.

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

1. The combination of a mandrel for forming sheet-metal cylinders and provided with a longitudinal groove; a reciprocating seaming-tool occupying the said mandrel-groove, and a stay to sustain the seam-parts of the cylinder while the seam is being made.

2. The combination of a revoluble mandrel; rollers operating in connection with the mandrel to form sheet-metal cylinders; and a seaming-tool for interlocking the longitudinal edges of the cylinder and reciprocating lengthwise of the mandrel.

3. The combination of a mandrel for forming sheet-metal cylinders and provided with a longitudinal groove; a seam-stay bar having a pressing face wider than the said longitudinal groove to press the sheet-metal cylinder on each side of the groove; and a reciprocating seaming-tool occupying the said mandrel-groove.

4. The combination of a mandrel for forming sheet-metal cylinders and provided with a longitudinal groove; rollers to form the sheet-metal cylinders on the mandrel; a seam-stay bar to press on the exterior of the cylinder; and a reciprocating seaming-tool occupying the said mandrel-groove.

5. The combination of a mandrel for forming sheet-metal cylinders and mounted to revolve; rollers mounted in a vertically-movable frame; a seam-stay bar movable independent of the roller-frame; and a seaming-tool for interlocking the longitudinal edges of the cylinder and reciprocating lengthwise of the mandrel.

6. The combination of a mandrel for forming sheet-metal cylinders and mounted to revolve; a seaming-tool for interlocking the longitudinal edges of the cylinder and reciprocating lengthwise of the mandrel; and intermittent gear for producing an intermittent rotary movement of the mandrel.

7. The combination of a mandrel for forming sheet-metal cylinders and mounted to revolve; a seaming-tool for interlocking the longitudinal edges of the cylinder and reciprocating lengthwise of the mandrel; intermittent gear for producing an intermittent rotary movement of the mandrel; and a cam for imparting a reciprocating movement to the seaming-tool.

8. The combination of a mandrel for forming sheet-metal cylinders and mounted to revolve; a seaming-tool for interlocking the longitudinal edges of the cylinder and reciprocating lengthwise of the mandrel; and a pusher to remove the cylinder from the mandrel.

9. The combination of a mandrel for forming sheet-metal cylinders and provided with longitudinal grooves; a reciprocating seaming-tool occupying one of the said mandrel-grooves; and a pusher attached to the seaming-tool-bar and occupying one of said grooves.

10. The combination of a mandrel for forming sheet-metal cylinders and provided with a longitudinal groove, *c*, and side grooves, g^2; a bar, C, movable in the longitudinal groove; a seaming-tool attached to the bar; and push-springs, *g'*, attached to the said bar and occupying the side grooves.

11. The combination of a longitudinally-grooved mandrel for receiving around it a sheet-metal body and mounted to revolve; a bar movable in said groove; and a catch or pusher reciprocated longitudinally of the mandrel to engage and advance the sheet-metal body surrounding the mandrel.

12. The combination of a longitudinally-grooved mandrel mounted to revolve; devices co-operating with said mandrel to form a sheet-metal body thereon; a bar movable in said groove and provided with pushers; and devices for retracting said bar after the body has been formed to permit the pushers to discharge said body.

13. The combination of the longitudinally-grooved mandrel upon which sheet-metal bodies are formed and mounted to revolve; body-forming devices co-operating with the mandrel; a bar occupying the groove in the mandrel during the body-forming operation and provided with a retractible catch; and devices for reciprocating said bar.

14. The combination of a revoluble mandrel on which sheet-metal bodies are formed; devices co-operating with said mandrel to form a sheet-metal body thereon; and a catch or pusher reciprocated longitudinally of said mandrel to engage the formed body and remove it lengthwise of the mandrel.

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

EDWARD SMALL.

Witnesses:
WM. L. DAVIDS,
W. VAN BENSCOTER.