No. 640,424. Patented Jan. 2, 1900.

E. C. & V. E. SMITH.

MANUFACTURE OF METAL TUBES OR CYLINDERS.

(Application filed July 18, 1899.)

(No Model.)

Fig. 1

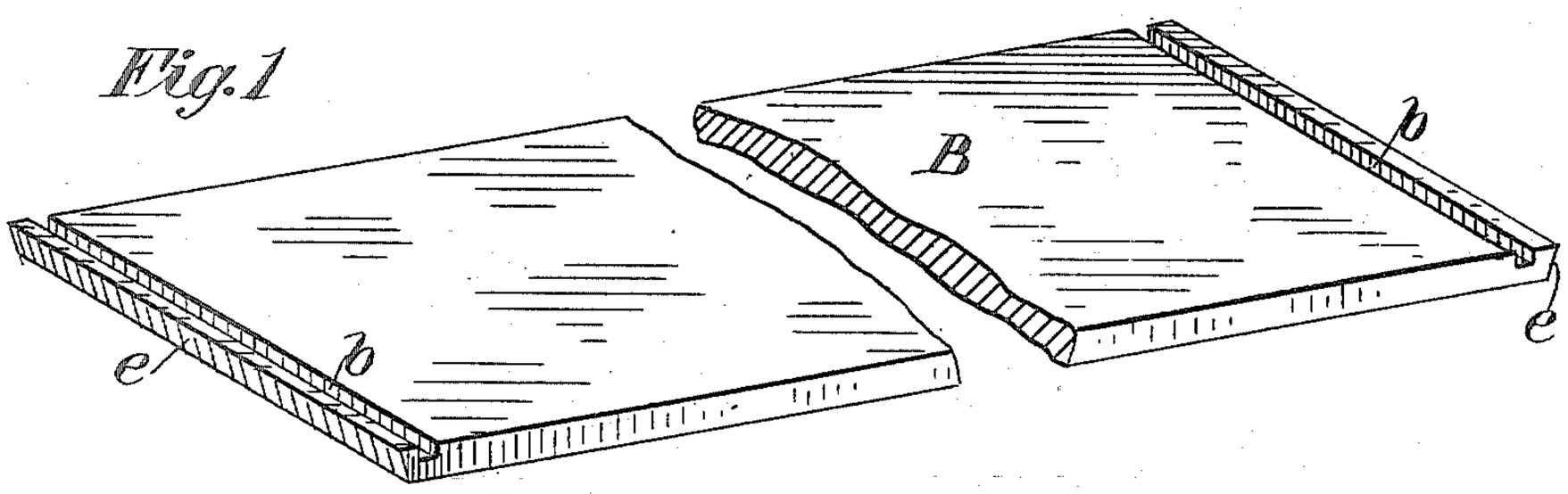


Fig. 2

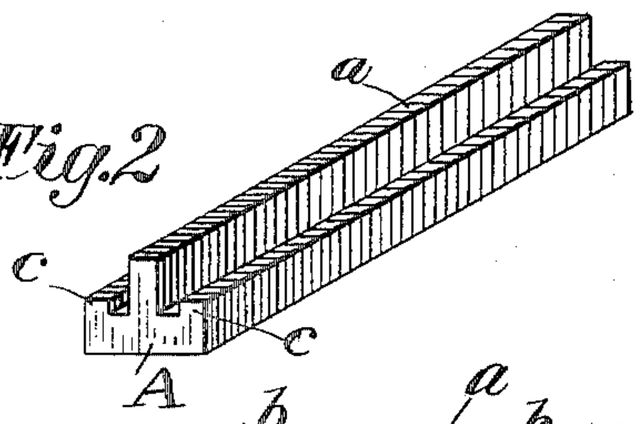


Fig. 3

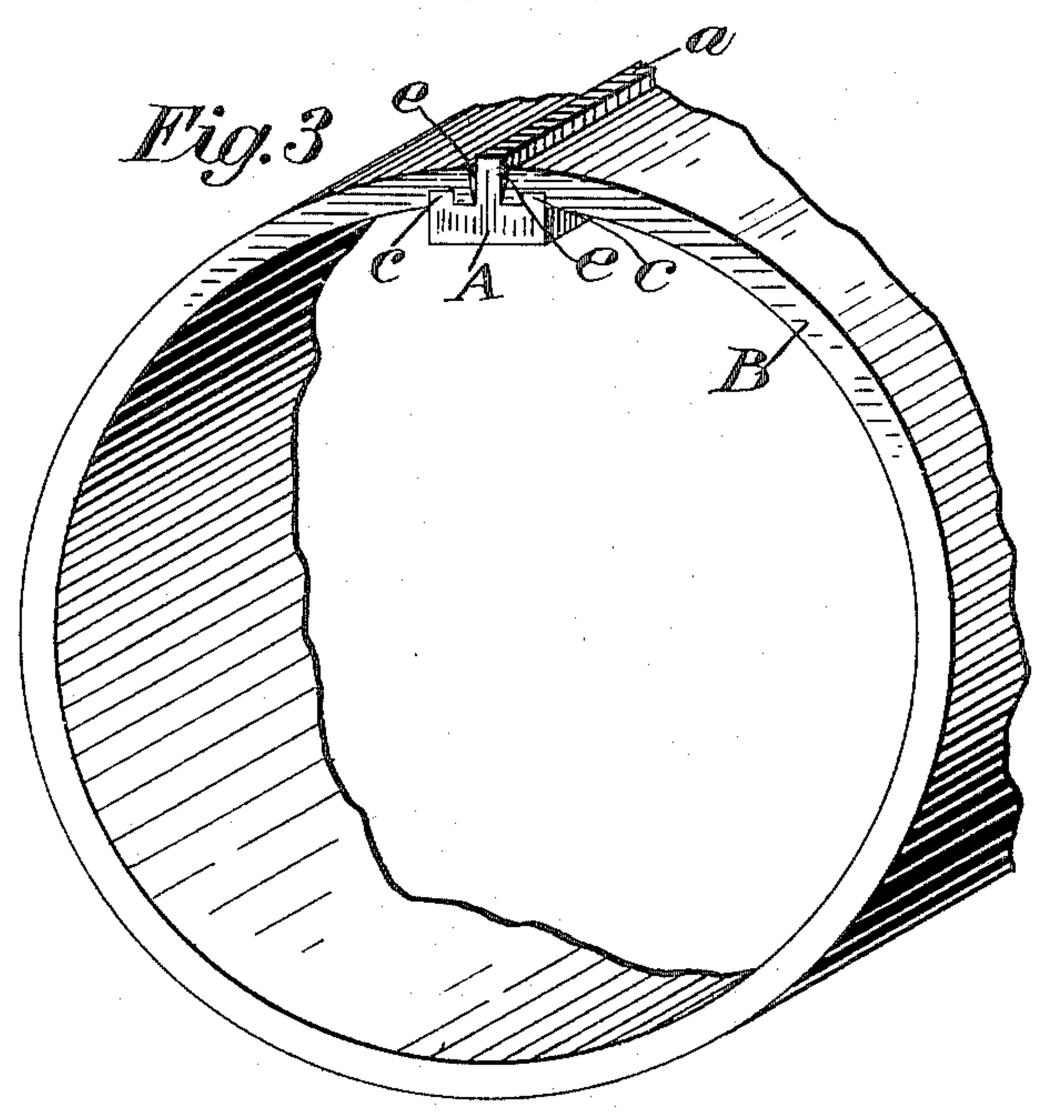


Fig. 4

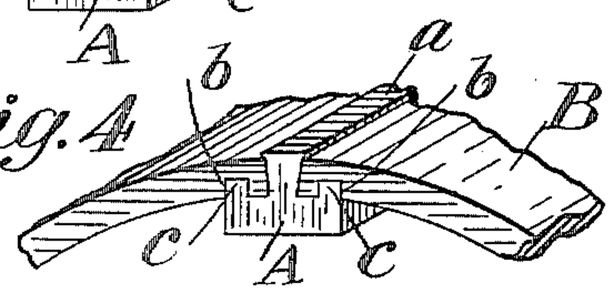


Fig. 5

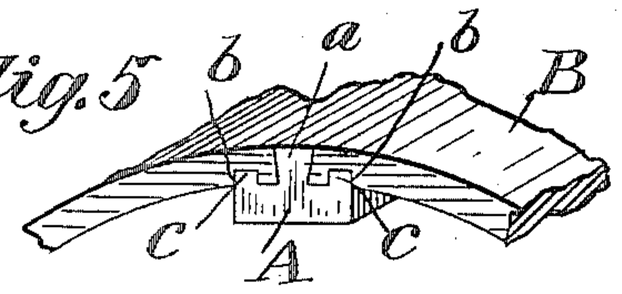


Fig. 6

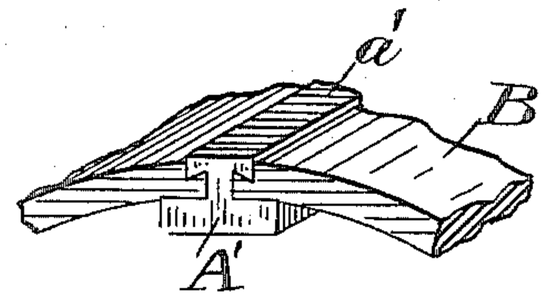


Fig. 8

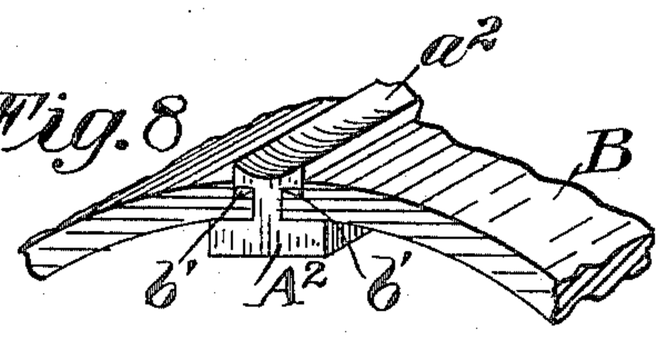
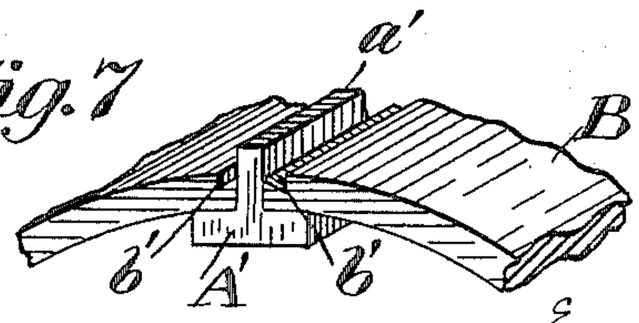


Fig. 7



WITNESSES:

Geo. B Rowley.

J. Green

INVENTORS

Eugene C. Smith and Victor E. Smith

BY

Thurston & Bowers

ATTORNEYS.

UNITED STATES PATENT OFFICE.

EUGENE C. SMITH AND VICTOR E. SMITH, OF PROVIDENCE, RHODE ISLAND, ASSIGNORS TO THE AMERICAN LITHOGRAPHIC COMPANY, OF NEW YORK, N. Y.

MANUFACTURE OF METAL TUBES OR CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 640,424, dated January 2, 1900.

Application filed July 18, 1899. Serial No. 724,319. (No model.)

To all whom it may concern:

Be it known that we, EUGENE C. SMITH and VICTOR E. SMITH, citizens of the United States, and residents of Providence, in the State of Rhode Island, have invented certain new and useful Improvements in the Manufacture of Metallic Cylinders or Tubes Used in the Art of Printing or Embossing, of which the following is a specification.

The object of this invention is to procure metallic tubes or cylinders of large diameter at a lower cost than it can be done by the present system of drawing tubes for that purpose.

It is a well-known fact that the making of metallic tubes by means of drawing, if such tubes are to have a diameter of, say, eight to twelve inches or more, is a very difficult and expensive matter. Some metals most desirable for such cylinders used in the art of printing on account of their good qualities for receiving the transfer of a drawing and an easy and perfect etching of the design are pure zinc and aluminium. It is impracticable in the present state of the art to produce a suitable tube or cylinder of pure zinc by means of the well-known process of drawing. The metal is too short or brittle, if cast into an ingot, for drawing into a tube of larger dimensions. It can be rolled into sheets; but even this is somewhat difficult. By means of our herein-described invention we overcome all of the special difficulties and great cost involved in the production of tubes of large size of pure zinc and aluminium, which are the most desirable metals to be used for printing-surfaces in the lithographic and typographic arts. Our method of forming such cylinders or tubes is comparatively simple, but practical and effective.

As a preliminary to the description of our invention it is proper to state that tubes or cylinders used for printing are mounted on rotary shafts or spindles, which are permanent parts of the printing-press. Such permanent shafts or spindles are commonly provided with a longitudinal groove, usually called a "key-seat," so that the tube or cylinder which has on its interior a corresponding longitudinal rib or key fitted in the groove of the shaft or spindle may be kept in a certain predetermined position and may be removed and replaced again at any time required in exactly the same position relatively to the shaft. We use this required key or projection on the interior of the tube as a medium for uniting the two abutting edges of a sheet of metal rolled up or bent into a tubular or cylindrical form. To this end angular grooves are formed in the sheet near the edges, which are to be brought together in forming it into a cylindrical shape, and a key is provided of T shape in transverse section, having angular flanges. This key is inserted with its web between the abutting edges of the cylinder and the angular flanges engaging in the grooves, so that by swaging or setting down the key the abutting edges of the cylinder are securely united, and the surface being then turned off true a strong and perfect tube or cylinder is formed, which is useful for the purposes intended.

Our method of producing such tubes or cylinders will be clearly understood from the following description, in connection with the accompanying drawings, in which—

Figure 1 is a perspective view of a plate having angular grooves near the edges which are to be brought together in forming the desired tube or cylinder. Fig. 2 is a perspective view of the T-shaped key. Fig. 3 is a perspective view of one end of the tube or cylinder, with the key in position ready for swaging or setting down to unite the abutting edges of the tube or cylinder. Figs. 4 to 8, inclusive, are detail perspective views of the joint. Fig. 4 shows the key swaged or set down before turning off. Fig. 5 shows the completed joint after turning off and polishing. Fig. 6 shows a modification in which the plate is provided with grooves on the outside, each in the form of a semidovetail, together with the key swaged or set down in readiness for turning off. Figs. 7 and 8 represent two forms of the key, in position previous to swagging, for forming the joint shown in Fig.

8, Fig. 7 showing a key of simple T form, and Fig. 8 a key of H form or with outwardly-flaring flanges on its outer side.

As an illustration we will describe the operation of making a cylinder of four feet in length and ten inches in diameter.

We first make a bar of metal of the same kind of which the metal sheet is made that is to be used for making the cylinder. The bar is the same length that the cylinder is to be. In cross-section this bar has a T or approximately T shape, as is shown at A, A′, and A^2 in Figs. 2, 3, 7, and 8, or other analogous form suitable for the purpose. The metal sheet B, out of which the cylinder or tube is to be made, is of a thickness desired for the walls of the tube or cylinder. In most cases three-sixteenths to three-eighths of an inch thickness is all that is required. This metal sheet is shown in Fig. 1. It is cut to conform to the length of the cylinder wanted and exactly wide enough to give the desired diameter of the tube or cylinder when it is rolled or bent into a tubular form, as shown in Fig. 3, which is done by means of the well-known three-roll metal-sheet-bending machine.

In the mode of applying our invention illustrated in Figs. 1 to 5 that side of the sheet which is to be the interior of the tube or cylinder is provided with two square grooves *b b*, which are about one-eighth inch deep and almost one-eighth inch from the longitudinal abutting edges of the sheet. The joining or abutting edges of the metal sheet are slightly beveled or cut back on that side of the sheet which is to be the outside of the tube or cylinder as it is indicated at *e e* in Figs. 1 and 3.

The web *a* of the key-bar is interposed between the abutting longitudinal edges of the tubular curved metal sheet, as shown in Fig. 3. This web is somewhat higher than the thickness of the metal sheet for the purpose of furnishing the required surplus metal which is to be spread by means of riveting or hammering it into two V-shaped grooves formed between it and the bevel edges *e e* and filling the same, thereby fastening the longitudinal edges of the tubular curved metal sheet firmly to the key-bar A. In Fig. 4 it is plainly seen that the web of the T-shaped key-bar when it is spread by riveting or hammering down becomes wedge-shaped. It forces the projections *c c* on the bar A into the grooves *b b* on the interior of the tube and forms the actual lock. It acts like the keystone in an arch. The small longitudinal grooves *b b* in the curved plate act as anchor-seats for the projections *c c* and prevent a spreading of the joints. The same action takes place when a modified form of a key-bar is used, as is shown in Fig. 6. The grooves *b′ b′* in the shape of a semidovetail are then made on the outside of the curved metal sheet. In this modification the interior of the key-bar is formed with a simple rectangular or flat head, as shown in Figs. 6, 7, and 8. The web may have the simple form shown at *a′* on Fig. 7 with sufficient depth to furnish the metal necessary to fill the dovetail grooves *b′* when swaged down, as shown in Fig. 6, or it may be formed with an exterior flange a^2, as illustrated in Fig. 8, concave on the outer side or flaring toward the edges, so as to provide metal to fill the grooves with less swaging action. We prefer, however, the form of key-bar illustrated in Figs. 2 and 3, and the correspondingly-grooved sheet first described as giving the best results. In either form of the invention the abutting edges of the cylinder are fixed together with a key of homogeneous metal, so as to give the effect of a practically integral cylinder which when turned and finished has the required evenly-polished surface without any perceptible joint.

It is evident that riveting or setting down the web *a* on bar A must be done on a solid base in the shape of an iron mandrel or shaft fitting the inside of the tube with a corresponding groove to receive that part of the T-shaped bar which projects on the interior of the cylinder.

We will remark that it is an easy matter to make the interior of the tube slightly tapering for the purpose and adapting it to be entered easily and brought to a firm fit on a correspondingly-tapered shaft used on the printing-machine. This is accomplished by cutting the metal sheet slightly narrower on one end corresponding to the inside taper. The outside of the tube or cylinder is then made to a straight or parallel surface by means of turning it to that shape.

As we stated in the beginning, zinc and aluminium are the most desirable metals for printing-surfaces in the litho and typo graphic arts.

An important feature of utility in our invention results from the fact that it is impracticable to unite the edges of zinc plates by hard solder or brazing, as practiced in forming tubes of copper. Moreover, if it were practicable the high heat required in hard-soldering by causing unequal expansion would be detrimental to the accuracy in form and proportions required in printing-cylinders. On the other hand, a joint or union formed of soft solder would not possess the requisite strength for printing-cylinders. It will be also understood that in the case of aluminium sheets a joint of requisite strength could not be produced by soldering.

By means of our above-described method we form small and large tubes or cylinders of said metals and make a strong, even, uniform, and reliable joint of abutting edges by means of a reliable mechanical contrivance, and do so at a cost much lower than it can be done by any other known method.

Having thus described our invention, the following is what we claim as new therein and desire to secure by Letters Patent:

1. A sheet-metal tube or cylinder formed

with parallel grooves adjacent to its abutting edges and with a flanged T-shaped bar interposed between said abutting edges and filling the parallel grooves so as to mutually interlock with the edges of the sheet as explained.

2. A metal tube or cylinder formed of a bent sheet having parallel grooves near its abutting edges in combination with an interposed key of T shape in transverse section having flanges engaging with the adjacent parallel grooves and swaged into close contact therewith so as to form a tight and secure joint adapted to be finished uniformly with the smooth surface of the cylinder, as explained.

3. A tube or cylinder formed of a sheet of metal curved in tubular shape, in combination with a T-shaped bar having a stem or web interposed between the adjacent edges of the tubular sheet and an internally-projecting head forming a longitudinal rib or key on the interior of the cylinder as explained.

4. A tube or cylinder formed of a curved metal sheet having grooves or recesses near its abutting edges and a T-shaped interlocking key-bar swaged into engagement with such grooves or recesses so as to securely unite the edges of the sheet and projecting inward so as to form a longitudinal rib or key on the interior of the tube or cylinder as explained.

EUGENE C. SMITH.
VICTOR E. SMITH.

Witnesses:
JOSEPH G. WEYER,
ALFRED A. SAUNDERS.