

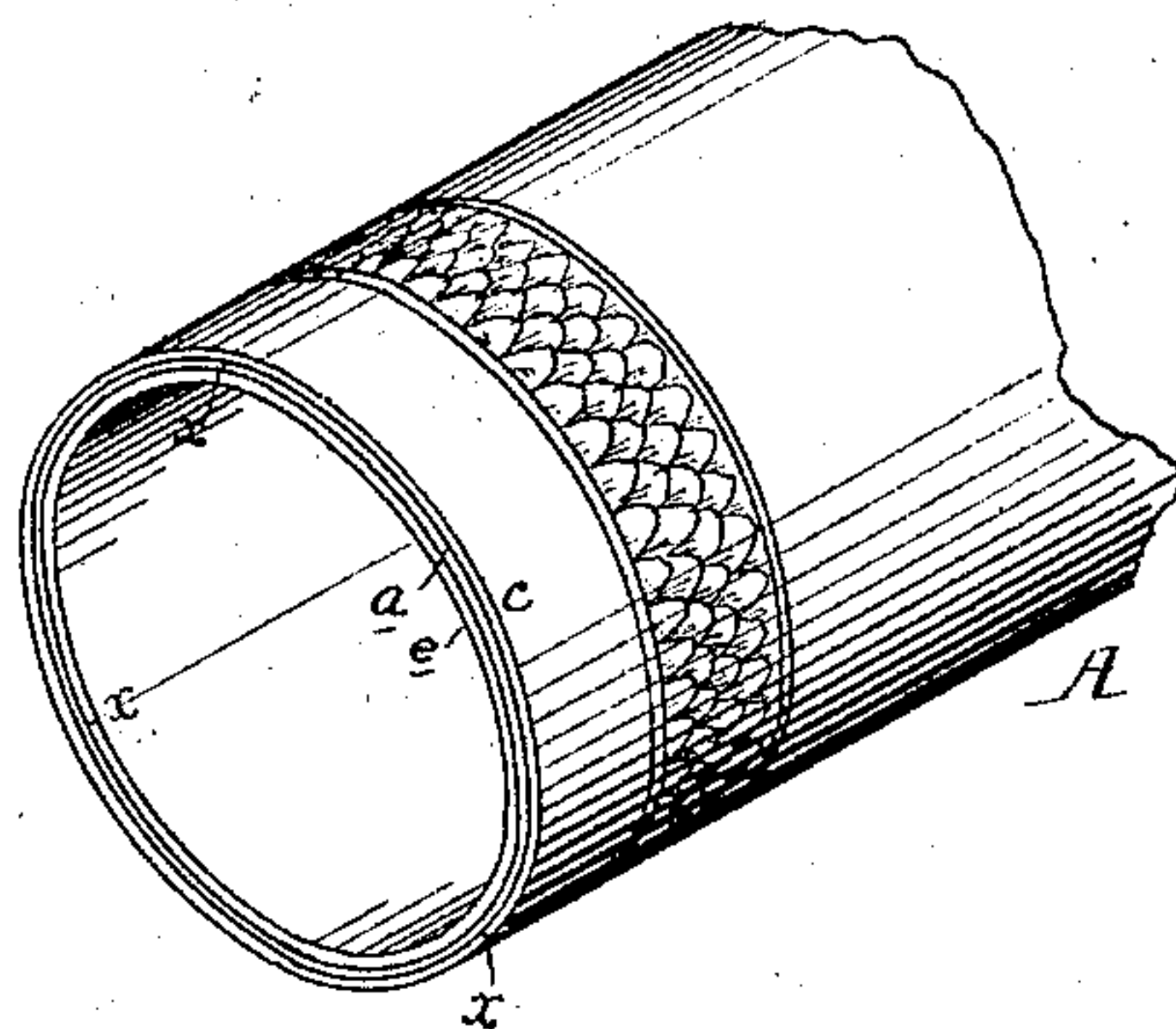
C. E. L. HOLMES.

MANUFACTURE OF METAL TUBES.

No. 184,152.

Patented Nov. 7, 1876.

*Fig. 1.*



*Fig. 2.*



Attest:

Harold G. Underwood.

Chas. F. Preskey

C. E. L. Holmes

By his atty

Charles E. Foster

# UNITED STATES PATENT OFFICE.

CHARLES E. L. HOLMES, OF NEW YORK, N. Y.

## IMPROVEMENT IN THE MANUFACTURE OF METAL TUBES.

Specification forming part of Letters Patent No. 184,152, dated November 7, 1876; application filed October 23, 1876.

*To all whom it may concern:*

Be it known that I, CHARLES E. L. HOLMES, of the city, county, and State of New York, have invented Improvements in the Manufacture of Metal Tubes, of which the following is the specification:

My invention consists of a tube of compound metal, which, while possessing the rigidity and strength of the harder metal, has the non-corrosive and other desirable properties of the softer and exterior metal.

In the manufacture of gas-fixtures, ornamental railings and other objects, tubes of brass, zinc, and other metals, polished, plated, or coated, have heretofore been employed, but with certain great disadvantages. For instance, brass is expensive and so hard that it can only be embossed by tools working under heavy pressure. Zinc, while cheaper, is objectionable on account of its incapacity to receive a fine polish, and want of luster.

While a finished surface may be obtained by plating or coating, these operations are expensive, greatly enhance the cost of the article, and afford a surface which will soon wear away by abrasion, and change its color under the influences of air and gases. To produce tubes which are not open to these objections, I first make a compound metal plate, consisting of a hard metal, *a*, and a soft metal, *c*, permanently united. While various metals may be employed, I have found that zinc and tin are most effective in combination. A plate or block of tin or tin compound, *c*, is applied to one or both sides of the block or plate *a* of zinc, and united thereto, forming one sheet of compound material, which is made into tubes *A* by bending and soldering, as usual; or tubes may be inserted, one within the other, and drawn down.

The zinc imparts the stiffness and strength which would render a tube wholly of tin or of a tin compound unserviceable, while the tin is capable of a high polish, and possesses a lustrous, unchangeable surface not pertaining to the harder metal.

Where greater stiffness is required, a thin iron tube, *e*, may be inserted into and drawn down with the others. When one tube is inserted in the other, care must be taken to arrange them to break joints, as shown in Fig. 1, where three joints, *x x x*, are equidistant from each other, the metals being in permanent union, insuring a tube of great strength. One of the chief advantages of the compound tube is the readiness with which the soft outer metal may be embossed by tools operated under a pressure readily resisted by the zinc, even when the tube is comparatively thin. While the tubes thus constructed are specially serviceable for the purposes designated, it will be apparent that they are also serviceable for use in cases where the outer metal is not affected by substances which would attack the inner and stiffer metal, as for the heating of acid-baths, &c., where the zinc or iron resists the pressure, while the tin prevents the chemical action which would destroy the more rigid material. Where the tin is applied inside as well as outside the stiffer metal, the tube may be used for conducting corrosive liquids as well as for other purposes.

I claim as a new article of manufacture—

1. A tube consisting of an outer hollow cylinder of tin or tin compound and an inner hollow cylinder of harder metal, as specified.

2. The mode of making compound tubes by uniting, permanently, a hard and a softer metal, and forming the compound sheet into tubes, with the soft metal on the outer face, as set forth.

3. A compound tube of two or more jointed concentric cylinders of tin or tin compound and a more rigid metal, with their longitudinal joints *x* at different points, as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

C. E. L. HOLMES.

Witnesses:

C. E. FOSTER,

FRED. BENJAMIN.