UNITED STATES PATENT OFFICE.

WILLIAM A. SHAW, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF HIS RIGHT TO L. H. ROGERS, OF SAME PLACE.

IMPROVEMENT IN THE MANUFACTURE OF METALLIC FOIL.

Specification forming part of Letters Patent No. **152,180**, dated June 16, 1874; application filed June 8, 1874.

To all whom it may concern:

Be it known that I, WILLIAM ANTHONY SHAW, of the city, county, and State of New York, have invented certain new and useful Improvements in the Manufacture of Metallic Foil, of which the following is a specification:

This invention relates to the manufacture of metallic foil, such, for instance, as lead covered with tin. Such foil has heretofore been made by casting ingots of lead coated with tin, and rolling them out together—a tedious and expensive process, and one in which there is much waste of material from the difficulty of making the metals roll together without breaking or cracking.

Now, I have discovered that metals may be pressed out of a retaining-vessel that would not admit of being rolled from their inferior ductility; and the object of this invention is to produce thin sheets or foil by such pressure.

To do this I take a retaining-vessel, made, by preference, oval in shape, with a plunger to correspond. This retaining-vessel has a die with an opening along its longer axis of the width of the foil to be made, a construction analogous to that employed in apparatus for making sheet-lead. Within this vessel is to be placed a series of wedge-shaped ingots of lead, or its alloys, superimposed one upon another, with their points turned toward and lying in the plane of the die-opening. Around these central ingots melted tin or its alloys is then poured, and when the whole has consolidated the mass is forced out through the die by pressure applied to the plunger. These wedge-shaped ingots are to be so made and adjusted in size and shape as to insure a uniform product in thickness of lead and tin. There may be a number of additional equidistant openings distributed around the die to allow surplus tin to escape, and for the purpose of relieving the pressure necessary to be used. The product may then be carried between rollers should it be required to further reduce the thickness.

The retaining-vessel for holding the charges of lead and tin can be made square or rectangular in shape, with a square or rectangular plunger fitted to it. There may, in this case, be a series of dies parallel to each other, and the charger may be made up of a number of tin ingots, each one inclosing lead, and placed side by side in the retaining-vessel. On applying pressure to the plunger, there will be a number of sheets of foil, as many as there are die-openings, formed at one operation. This arrangement will diminish the amount of pressure required to work the machine, and will allow the process to be conducted with more rapidity.

If desired, a fixed core may be placed within the retaining-vessel, the plunger traveling around and over this core. The latter may be rectangular, oval, or other suitable shape, and be hollowed so as to allow a hot-blast, or steam, or other heating medium to be supplied to the center of the charge; or cold water may in like manner be admitted, according to the nature of the material being operated upon. Another office of this case is to cause the metals composing the charge to issue uniformly and evenly from the die, even should they be formed into ingots or blocks with parallel sides.

The retaining apparatus may be heated or cooled in any suitable manner, as is well known and practiced in making metallic pipes.

The charges or ingots, in lieu of being cast in the retaining-vessel, may be cast in molds and afterward placed in the retaining apparatus, and then pressed out therefrom in the form of sheets or foil, as above provided. The dies for forming the sheets, instead of being in the bottom of the retaining-vessel, may be placed within the face of the plunger, which in this case must be made hollow for the escape of the material; or they may be placed in a suitable holder at the bottom of the retaining-vessel. The latter may be stationary, and the pressure communicated to the plunger, or the ram or plunger may be stationary, and the pressure applied to the retaining-vessel.

The dies through which the metal mass is forced are of any suitable construction; as, for instance, they may consist of rolls mounted in a frame, and bottom piece suitably adjusted to the digester or retaining-vessel. These parallel rolls may be arranged so as to be set at different distances from each other to make sheets of different thicknesses. Two or more

sets of such rolls may be placed, one in rear of the other, so that the metals pass through from one to the other. These rolls may be positively rotated by independent driving mechanism, if desired.

The ingots of metal can be cast in molds, so constructed as to form tongues and grooves on the faces of the ingots, which may thus be fitted and locked together, and afterward pressed out through the machine; or ingots prepared in this manner may be rolled by means of an ordinary rolling-mill.

My foil can also be made by means of presses having one or more cylinders, or power-presses with cylinders or retainers of one or more divisions, such, for instance, as described in my Letters Patent dated February 18, 1868, antedated February 6. This apparatus was designed for tin-lined lead pipe, but with slight modifications as regards the structure of the die, &c., which will readily suggest themselves to one having knowledge of the art to which this invention pertains, such an apparatus can be employed in my new process of manufacturing metallic foil composed of two or more different metals.

My foil thus produced is composed of a center of lead or its alloys with exterior laminæ of tin or its alloys, the whole compressed and united in one solid leaf, free from the irregularities, imperfections, and inequalities in the thickness of the lead and tin found in foil made in the ordinary way.

Having described my invention, and the manner in which the same is or may be carried into effect, what I claim, and desire to secure by Letters Patent, is—

The manufacture of metallic foil composed of two or more of the ductile metals, by pressing said metals simultaneously and together out from a retaining-vessel or vessels through one or more die-openings, substantially in the manner described, with or without a subsequent rolling of the compound sheet so formed.

In testimony whereof I have hereunto signed my name this 25th day of May, A. D. 1874.

WM. ANTHONY SHAW.

Witnesses:
M. M. BUDLONG,
JOHN M. BOLLING.