No. 623,653. Patented Apr. 25, 1899.

R. A. CARTER.

PILE FOR MANUFACTURING SHAFTS, &c.

(Application filed Jan. 27, 1898.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

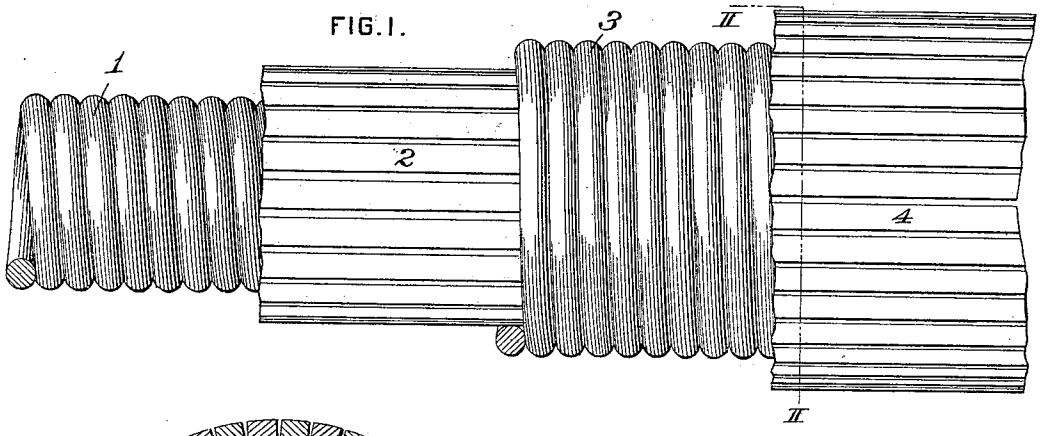


FIG. 4.

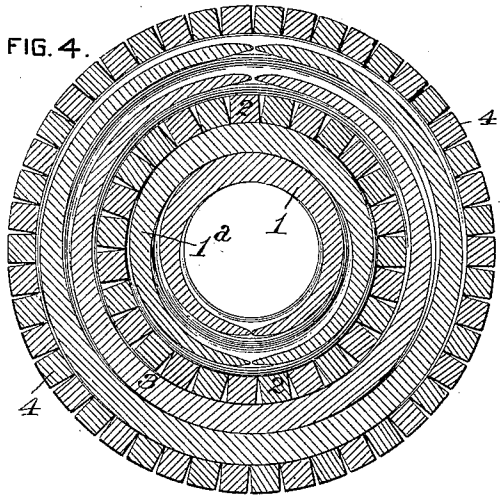


FIG. 2.

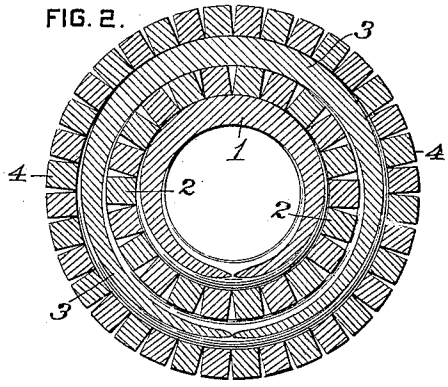
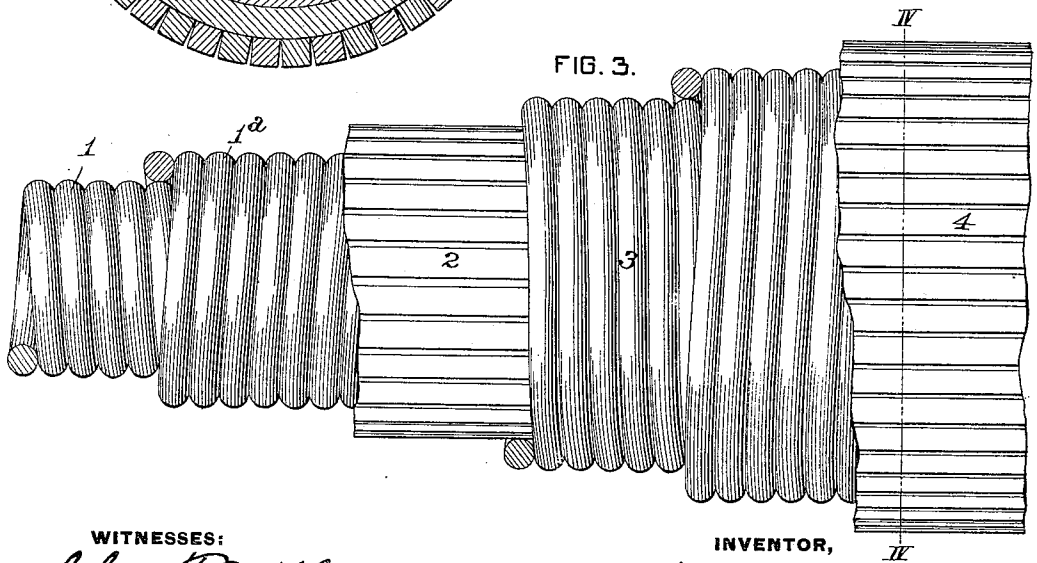


FIG. 3.



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(No Model.) 2 Sheets—Sheet 2.

FIG. 5.

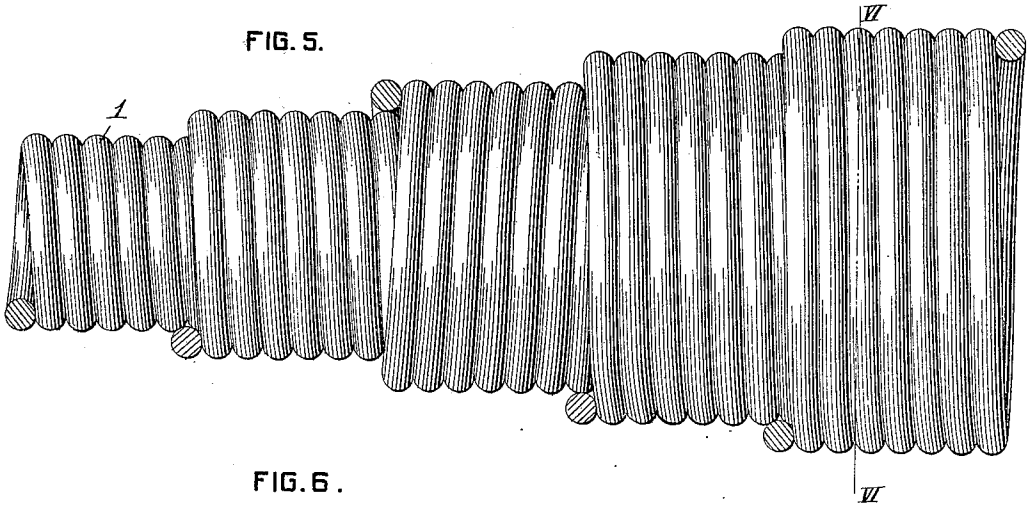
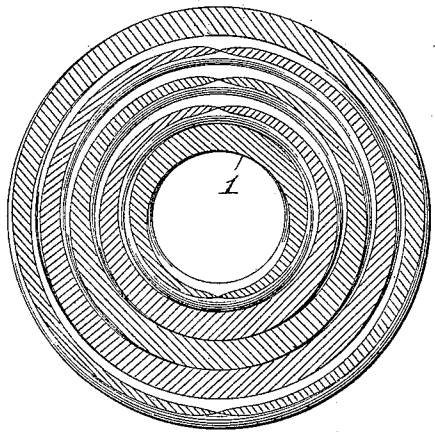


FIG. 6.



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UNITED STATES PATENT OFFICE.

ROBERT A. CARTER, OF PITTSBURG, PENNSYLVANIA.

PILE FOR MANUFACTURING SHAFTS, &c.

SPECIFICATION forming part of Letters Patent No. 623,653, dated April 25, 1899.

Application filed January 27, 1898. Serial No. 668,118. (No model.)

To all whom it may concern:

Be it known that I, ROBERT A. CARTER, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in the Manufacture of Shafts, &c., of which improvements the following is a specification.

The invention described herein relates to certain improvements in the formation of piles for the manufacture of shafting, the improvements being more especially applicable for the manufacture of hollow shafting or tubing which is subjected to torsional strains.

As is well known, shafts for steamboats or other purposes are subjected principally to torsional strains; and the invention described herein has for its object such a disposition or arrangement of the pieces forming the pile that a portion at least of such material shall have the fibers thereof so arranged with relation to the direction of such torsional strains as to present the greatest possible resistance thereto.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a side elevation of a pile having the billets forming the same arranged in accordance with my improvement, portions of each layer of billets being broken away to more clearly illustrate the arrangement. Fig. 2 is a transverse section, the plane of section being indicated by the line II II, Fig. 1. Fig. 3 is a view similar to Fig. 1, illustrating a modification of my improvement. Fig. 4 is a transverse section, the plane of section being indicated by the line IV IV, Fig. 3. Figs. 5 and 6 are views similar to Figs. 1 and 2, illustrating modifications in the manner of forming a pile.

In the practice of my invention as applied to the manufacture of hollow shafting or tubing a cylindrical foundation 1 is formed by coiling a suitably-shaped billet, preferably round in cross-section, into a tubular form. This coiling may be effected over a mandrel or in any other suitable manner known in the art. The mandrel, which may consist of a tube or solid bar of suitable diameter, is withdrawn after the pile is formed. It is preferred that the coils should be so formed that adjacent coils will be in or nearly in contact with each other, so as to facilitate their being welded together, as hereinafter described, and in order to prevent a too great separation thereof when heated. A certain amount of separation will be caused by the expansion of the metal when the piles are heated. On this foundation 1 is placed the second layer 2, formed of billets, preferably square in cross-section and arranged, as shown, parallel with the axes of the foundation portion. While it is preferred, as stated, to form the second layer of billets square in cross-section, they may be round or of any other suitable cross-sectional shape, provided that when arranged upon the foundation 1 they will not be closely in contact, but will leave interstices or passages between adjacent billets, as clearly shown in Fig. 2, for the permeation of heat into the interior portions of the pile. The third layer 3 is formed by coiling a billet, preferably round in cross-section, around outside of the layer 2, thereby firmly binding the latter upon the foundation. Outside of this third layer is arranged a fourth layer 4, consisting of billets of suitable shape in cross-section, as above described, and arranged parallel with the axes of the spiral layers. Any number of additional layers may be added to the pile, dependent upon the size of the shaft or tube to be formed. The pile thus constructed is heated in the usual or any suitable manner to a welding heat, the interstices or passages formed by the longitudinal billets and the radial openings due to the separation of adjacent coils when heated permitting of the thorough permeation of the heat and also of the escape of cinder, &c., from the interior of the pile. This pile can be worked down under the rolls or hammer, an internal mandrel being employed to prevent the distortion of the pile.

The spiral layers should be formed of right or left hand coils, dependent upon the direction in which the shaft is to be rotated—that is to say, if the shaft is rotated from right to left the coil should be formed from left to right, so that the fibers of such coil will be subjected to tension rather than compression when the shaft is in use. The longitudinally-arranged billets will give the shaft the desired strength as against longitudinal strains

and will also serve as binders on the inner and outer surfaces of the spirals to tightly bind the individual members thereof together.

Where shafts are to be subjected to torsional strains in both directions—that is, are to be rotated approximately the same amount in both directions—some of the layers can be formed by right-handed spirals and the adjacent layer, as 1^a, can be formed by a left-handed spiral, and, if desired, the pile can be formed as clearly shown in Figs. 3 and 4. While it is preferred to arrange the right and left hand spirals or coils one upon the other and then arrange the longitudinal billets outside of these coils, longitudinal billets may be arranged between each spiral or coil.

The pile may be formed of two or more layers arranged as described, or the inner layer may be formed by longitudinal billets and the external layer by a coiled billet.

As shown in Figs. 5 and 6, the pile may be formed entirely of coiled billets. The coils composing the pile may be either right or left handed, or some may be right-handed and some left-handed, in which case they are arranged alternately, as shown.

It is preferred to proportion the sizes of the billets in accordance with their location in the pile, as fully described in application, Serial No. 663,667, filed December 27, 1897. As stated in said application, the smallest billets form the middle part of the pile, and the billets forming the other portions increase in size proportionally to their distance from the center. This proportioning of the sizes of the billets insures a homogeneity of metal in the finished article.

I claim herein as my invention—

1. A hollow pile for the manufacture of shafts, &c., consisting of two or more layers formed of spirally-coiled billets and one or more layers of billets arranged parallel with the axes of the coiled billets and alternating therewith, substantially as set forth.

2. A pile for the manufacture of shafts, &c., consisting of two or more layers formed of spirally-coiled billets, one of said layers forming the interior of the pile, and one or more layers of billets arranged parallel with the axes of the coiled billets and alternating therewith, substantially as set forth.

In testimony whereof I have hereunto set my hand.

ROBERT A. CARTER.

Witnesses:
DARWIN S. WOLCOTT,
F. E. GAITHER.