(No Model.)

A. H. EMERY.

MANUFACTURE OF METALLIC COLUMNS.

No. 322,050. Patented July 14, 1885.

Fig: 1

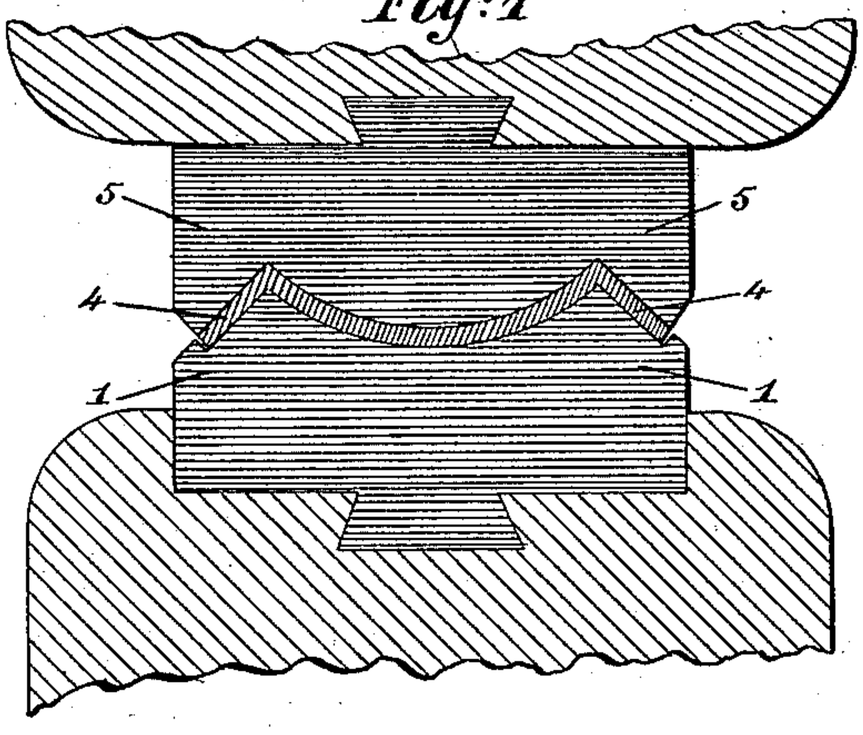


Fig: 2.

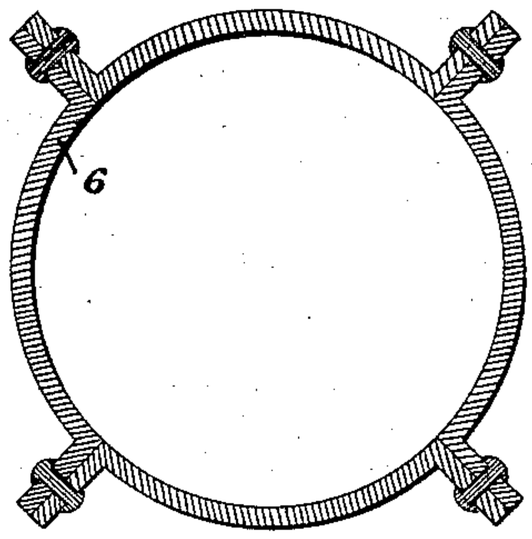
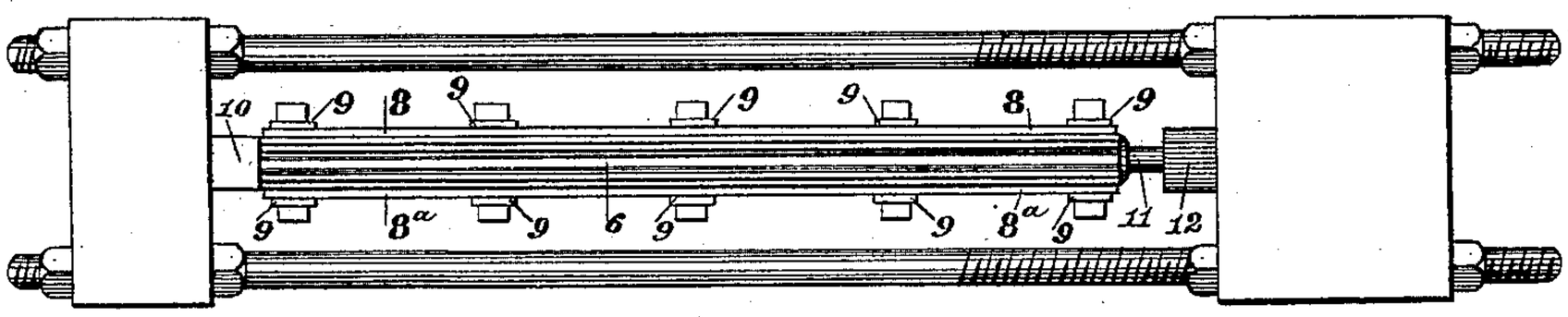


Fig: 3



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ALBERT H. EMERY, OF STAMFORD, CONNECTICUT.

MANUFACTURE OF METALLIC COLUMNS.

SPECIFICATION forming part of Letters Patent No. 322,050, dated July 14, 1885.

Application filed April 2, 1883. (No model.)

To all whom it may concern:

Be it known that I, ALBERT H. EMERY, of Stamford, in the county of Fairfield and State of Connecticut, formerly of New York, in the State of New York, have invented a new and useful improvement in the mode or process of constructing columns, braces, and other compression members of bridges, buildings, and other structures, of which the following is a specification.

The object of my invention is to increase the rigidity and ultimate strength of compression members of bridges, buildings, and other structures; to which end I subject the parts of which a compound column or other compression member is to be made, or the entire column or other member, if made in one piece, to compression by dies or rolls, preferably the former, while in a cold or moderately-heated state, in order to condense the metal, and I subsequently subject the entire column or other member to compression endwise or in the direction in which its load will be sustained in use, the pressure being in excess of the elastic limit and sufficient to impart a permanent set. By this means the elastic limit of the structure will be raised, and its rigidity and ultimate strength to resist a load of compression or a crushing strain materially increased.

In order that the invention may be fully understood, I will proceed to describe it with reference to the accompanying drawings, in which—

Figure 1 is a transverse section of the compression-dies, showing one member of a compound column under compression to condense the metal. Fig. 2 is a transverse section of such a column. Fig. 3 is a plan illustrating the application of endwise compression to the column.

As intimated, the invention is applicable to the treatment of columns or other compression members of bridges, buildings, or other structures, whether made in one piece or in a number of parts combined by riveting or otherwise. For the purpose of illustration I have shown in the drawings the mode of treating the parts of a compound column and the complete column.

In Fig. 1, 1 represents a bed-die formed to correspond exactly with the shape of one face of the column member 4, which is placed thereon, and 5 an upper die formed with a face to correspond exactly with the upper surface of the column member 4, and forced down to apply pressure thereto by any adequate means—such, for example, as hydraulic presses or rams. The pressure on the column member is sufficient in degree to permanently condense the metal, and is maintained for a sufficient period of time to permit the particles of metal to accommodate themselves to each other in their closer relations. The column members having been in this manner compressed, so as to permanently condense the metal of which they are composed, may be assembled and secured together in the usual way by riveting or bolting through their flanges or margins. The entire column is then compressed longitudinally. This may be effected by means of the press shown in Fig. 3, having one or more wedge-shaped followers, 9, or other adequate means for sustaining the column against flexure, either one or both of the clamping-jaws 8 8^a being made adjustable, as preferred. One end of the column is sustained by an abutment, 10, and a plunger, 11, is pressed against the other end by means of a hydraulic ram, 12, with sufficient force to compress the metal endwise of the column beyond the limit of elasticity, imparting a permanent set. This pressure is maintained for a considerable period to permit the particles of metal to become seated in their new relations.

If preferred, the separate sections of the column may receive the required endwise set by compression applied to them severally before assembling.

The same principle is applied to either solid or hollow columns made in one piece, instead of compound, as hereinbefore described, by pressing the entire column transversely in sections between dies formed to fit its surface. In the case of a hollow column, a supporting-mandrel is applied to the interior, either the whole length of the column or made adjustable therein, but in all cases extending to a greater length than the external condensing-dies. After the metal of the column has been thus condensed by lateral pressure, longitudinal pressure is applied to the column sufficient to give it a permanent set, as before explained.

In all parts of the operation the condensing and setting pressure is applied to the metal while in a cold or moderately-heated state.

The lateral and longitudinal compression of

the metal each imparts to it a higher limit of elasticity and greater ultimate strength, and the longitudinal compression of the column previous to use (either with or without previous condensation) imparts a higher limit of elasticity and greater ultimate strength to the column.

I am aware that it is an old and well-known process to compress metal in order to condense it. This, therefore, I do not broadly claim.

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

1. The mode or process of increasing the strength and rigidity of a column, brace, or other compression member, which consists in compressing it longitudinally while in a cold or moderately-heated state with sufficient force and for a sufficient time to reduce its length and impart a considerable permanent set to the material.

2. The mode or process of increasing the strength and rigidity of a column, brace, or other compression member of a bridge or other structure, which consists in compressing it longitudinally in a cold or moderately-heated state, while stayed against flexure, with sufficient force and for a sufficient time to reduce its length and impart a considerable permanent set to the material.

3. The improved mode or process of increasing the strength and rigidity of columns, braces, or other compression members of bridges or other structures, which consists in condensing the metal by pressure while it is in a cold or moderately-heated state, and subsequently compressing the column longitudinally with sufficient force and for a sufficient period of time to impart a considerable permanent set, reducing its length without flexure.

4. The improvement in the mode or process of manufacturing compound columns, braces, or other compression members of bridges and other structures, which consists in compressing the separate parts or members thereof while in a cold or moderately-heated state, so as to condense the metal, assembling and connecting the parts in any customary or suitable manner, and subjecting the whole to a longitudinal strain, permanently compressing the structure in the direction of its length.

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