(No Model.) 2 Sheets—Sheet 1.

J. H. CARPENTER.

HARDENED METALLIC PLATE.

No. 541,422. Patented June 18, 1895.

Fig. 1.

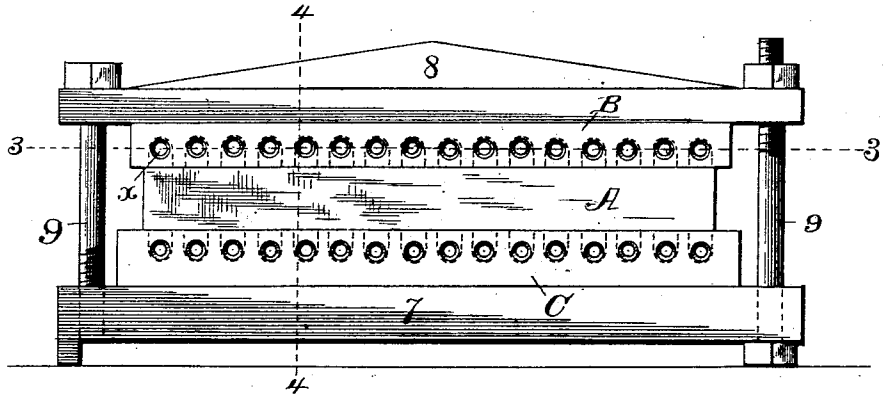
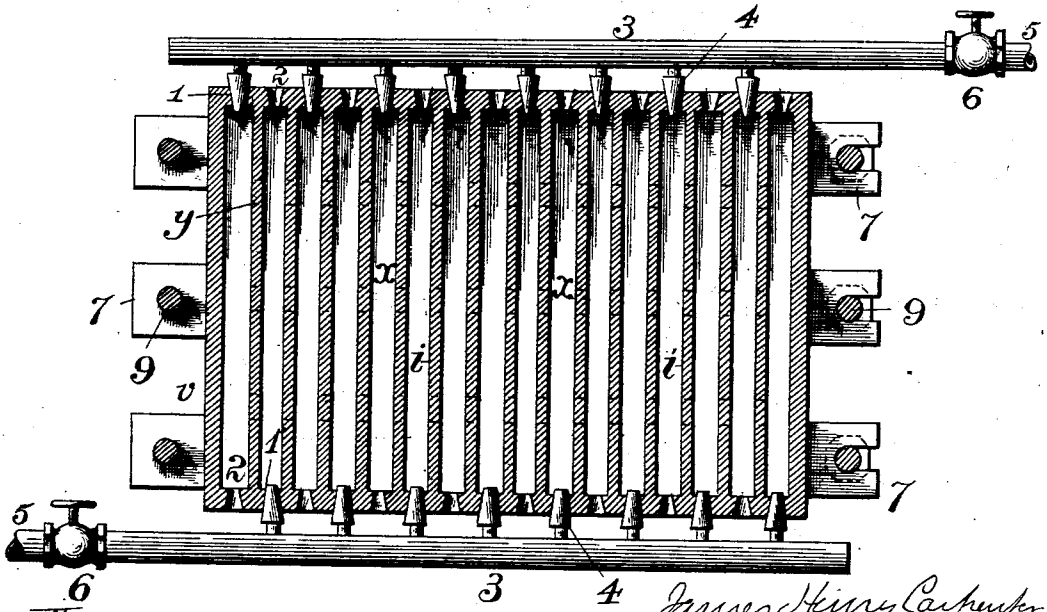


Fig. 3.



Witnesses:
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H. L. McArthur

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(No Model.) 2 Sheets—Sheet 2.

J. H. CARPENTER.

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Fig. 4.

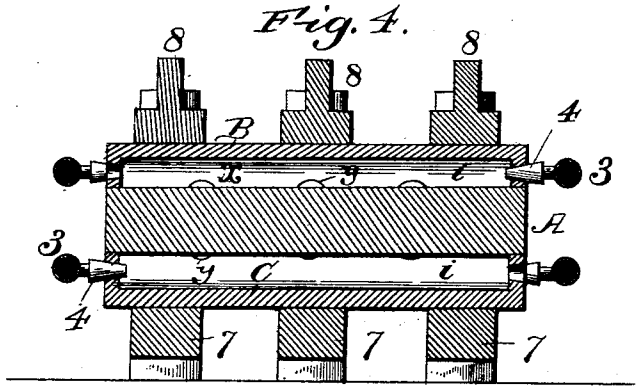


Fig. 2.

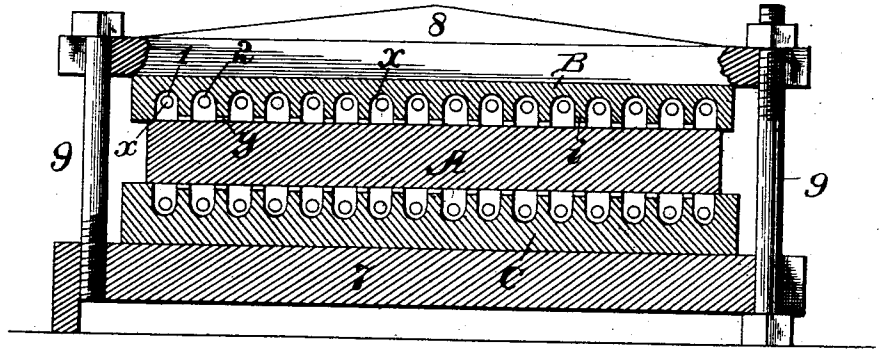
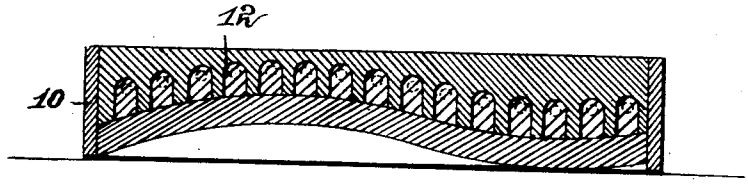


Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES H. CARPENTER, OF READING, PENNSYLVANIA.

HARDENED METALLIC PLATE.

SPECIFICATION forming part of Letters Patent No. 541,422, dated June 18, 1895.

Application filed March 21, 1891. Serial No. 385,868. (No model.)

To all whom it may concern:

Be it known that I, JAMES HENRY CARPENTER, a citizen of the United States, residing at Reading, Berks county, State of Pennsylvania, have invented certain new and useful Improvements in Hardened Metallic Plates, of which the following is a specification.

In the manufacture of armor for vessels it has become desirable to increase the efficiency of the plates by subjecting them to the action of water, oil, or solutions, which in consequence of the size and weight of the plates must be poured or thrown upon the latter while they are stationary and in a heated condition.

It has been found that the result of such treatment is to warp or twist the plates to such an extent as to greatly impair their efficiency, while the method of applying the liquid results in hardening the plates unequally, increasing their liability to crack or splinter when struck. Further as the fluid is applied to the plates while they rest unconfined upon suitable supports of the furnace in which the plates are heated, or in the place to which they are moved after heating, there is nothing to resist the tendency of the plates to warp or bend, and when such warping or bending occurs the plates are hardened in their bent position and cannot afterward be straightened.

I have found that if the plates are combined with supports or bearings that will prevent them from twisting when the fluid is applied, but comparatively little resistance is required to maintain them straight or in their original shape during the process of hardening, and that the bearings in such case resist the tendency of the plate to warp without necessarily clamping them under any heavy pressure. Different means may be employed for thus supporting the plates and for affording the requisite bearings, as for instance the apparatus illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the apparatus which I employ in carrying out my improved process. Fig. 2 is a longitudinal sectional elevation. Fig. 3 is a plan in section on the line 3 3, Fig. 1. Fig. 4 is a transverse section on the line 4 4, Fig. 1. Fig. 5 is a view illustrating one mode of forming the bearings for the plates.

A, represents a plate to be hardened, which may be an armor plate, a gun track or other article; and B and C represent the supports for the isolated bearings or contacts, said supports retained in fixed positions upon opposite sides of the plate. Said supports may be horizontal or vertical, of metal or any other suitable material, with ribs, pins, or lugs constituting bearings or contacts, the ends of which are in a plane that conforms to the plane of the face of the plate whether it be flat or curved.

To permit the fluid used for hardening or tempering the plate to be applied with desired rapidity and uniformity to the entire surface of the plate, I prefer to make the bearings in such form as to allow the fluid to circulate or travel freely over the surface of the plate and around or beside the separated bearing points, which are in such proximity as to afford the requisite support. To this end I provide the supports with grooves or channels between parallel bearing ribs *i* which grooves as shown, are in the form of transverse parallel channels or grooves *x*, closed at the ends but open at the faces opposite the plate, and, if desired, with transverse openings *y*, whereby each support has a continuous edge flange *v* bearing on the plate A, and a series of intermediate bearings or contacts *i*.

To permit the rapid admission, passage and exit of the fluid, I provide each channel *x*, with an inlet port 1, at one end and an outlet port 2, at the other, the inlet port of one channel being adjacent to the outlet port of the contiguous channel, so that the fluid is admitted to the channels upon opposite sides or edges of the plate, traveling through the contiguous channels in opposite directions, whereby it is supplied uniformly over the entire surface of the plate, instead of being admitted wholly at one edge and flowing over the whole plate in one direction toward the opposite edge. By this means the temperature of the plate is quickly lowered over its entire extent with a uniformity which would otherwise not be practicable, and the plate is uniformly hardened.

In order to permit the fluid to be rapidly directed to alternate channels in opposite directions after the supports and plate are in proper position, more especially when the supports are portable or removable, I make use of supply pipes 3, 3, each with a series of tapering nozzles 4, adapted to fit the tapering ports 1, into which they may be quickly introduced, the taper being of such a character that a slight blow will cause each nozzle to firmly take its seat in the port; and each pipe 3, is supplied with the fluid through a flexible pipe 5, provided, if desired, with a cock 6. If necessary any suitable locking means may be employed for holding the pipes 3 and their nozzles in proper position during the flow of the fluid. These operations may be performed upon the plate A, either while the same is in a chamber wherein it has been heated by the flow of suitable hot gases, or the plate may be removed from a heating furnace and placed upon a lower horizontal support C, and the upper support then applied and secured in position, or the plate may be introduced between vertical supports.

While the supports B and C may be secured in position in any desired practicable manner I have shown the same as arranged horizontally, the support C resting on cross bars 7 and supporting the plate A, the upper support D resting upon the plate, and top bars 8 resting upon the support D and confined against the plate by means of the screw bolts 9, passing through slots in the bars 8; with nuts 15 confining the bolts in place or otherwise arranged so as to clamp the plates in position after adjustment and maintain them in place to prevent any movement of the bearings during the operation upon the plate A. In some cases where the plate A, requires to be subjected to the action of fluid upon one side only, a channeled support need be employed only upon that side of the plate where the fluid is to be applied.

The channeled support may be of metal, cement, or other suitable material, and the same may be cheaply and expeditiously made so as to fit the contour of the plate, whatever may be its shape, by surrounding the plate (or a pattern corresponding therewith) with a frame 10, Fig. 5, so as to form a flange of requisite depth, and placing upon the surface of the plate a series of cores 12, parallel to each other, with sufficient intervening space to form the bearings, and then pouring molten iron, cement, or other molten or plastic material upon the plate and cores, thereby casting the bearings in direct contact with the plate or its pattern.

Although I have referred to the supports as consisting each of a single block having a series of contacts and channels or passages between the same, I use in connection with large or irregular plates supports in two or more sections each in the form of a channeled block, or the bearings may consist of separate bars or plates bearing with their edges against the face of the plate A, and each held or clamped or otherwise supported in a fixed position to resist any tendency of the plate A to warp or twist.

In some cases it is desirable to subject the plate to be hardened to the influence of fluids of different kinds or different temperatures in which case a fluid of one kind or temperature will be admitted to the pipes 3 of one support B, while another kind of fluid, or fluid at a different temperature, will be admitted to the pipes of the other support C.

Without limiting myself to the precise construction and arrangement of parts shown and described, I claim—

1. The within described improvement in hardening metallic plates consisting in heating the plate confining it between immovable bearings having limited points of contact with the opposite sides of the plate, and passing a cold fluid over one surface and a heated fluid over the opposite surface, substantially as set forth.

2. In the manufacture of hardened metallic plates, heating the plate, confining it between bearings having limited points of contact with the surface or surfaces of the plate, and simultaneously passing different currents of hardening fluid across said surface or surfaces in opposite directions from opposite sides or edges, substantially as set forth.

3. The combination of the channel support having inlet and outlet ports, and two supply pipes provided with nozzles adapted to the alternate ports at opposite edges and each communicating with a source of fluid supply, the said ports being at the ends of the channels and the nozzles entering alternate ports, substantially as described.

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

JAMES H. CARPENTER.

Witnesses:
G. P. KRAMER,
J. S. BARKER.