

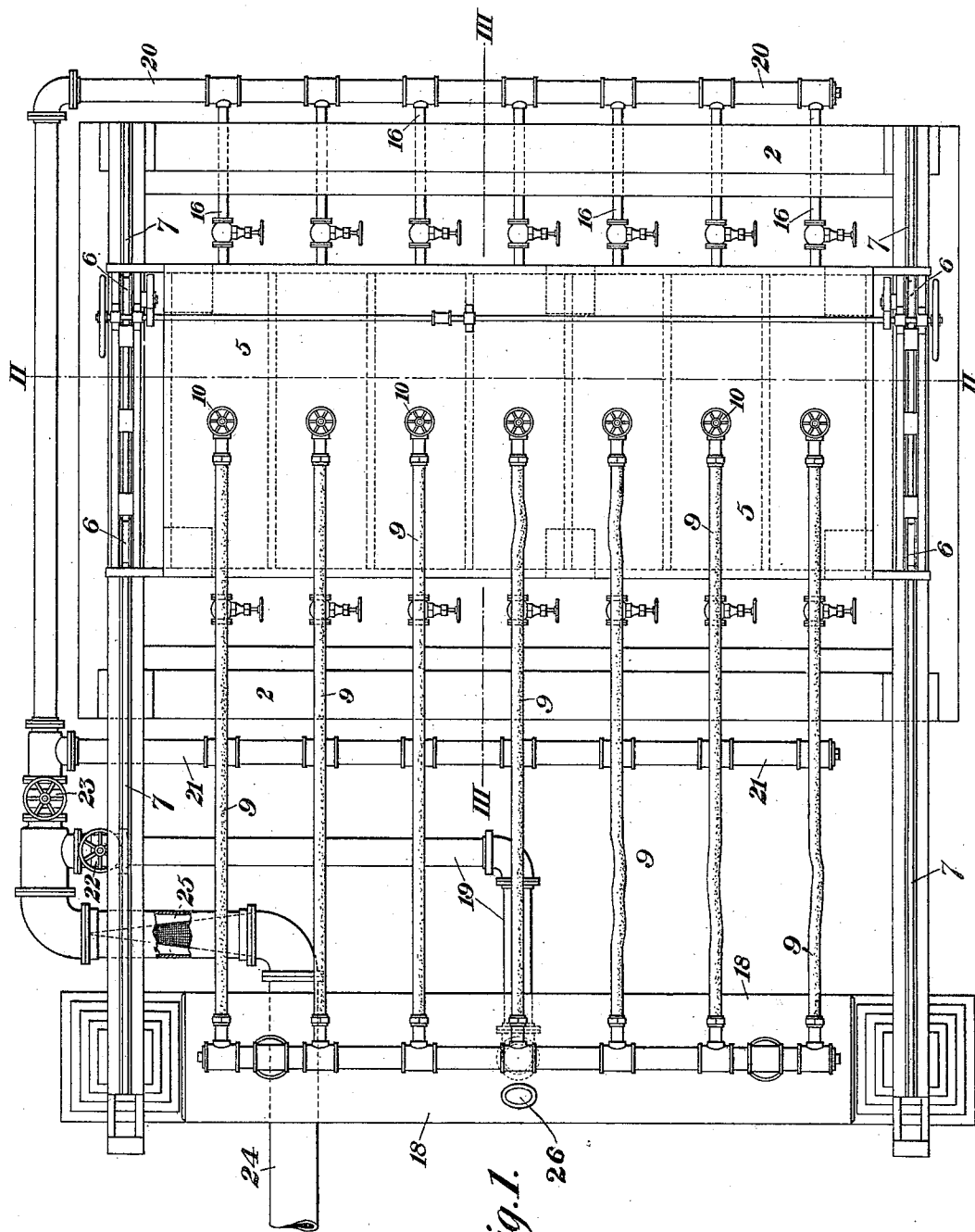
(No Model.)

3 Sheets—Sheet 1.

W. WHIGHAM.
HARDENING APPARATUS.

No. 543,973.

Patented Aug. 6, 1895.



WITNESSES

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(No Model.)

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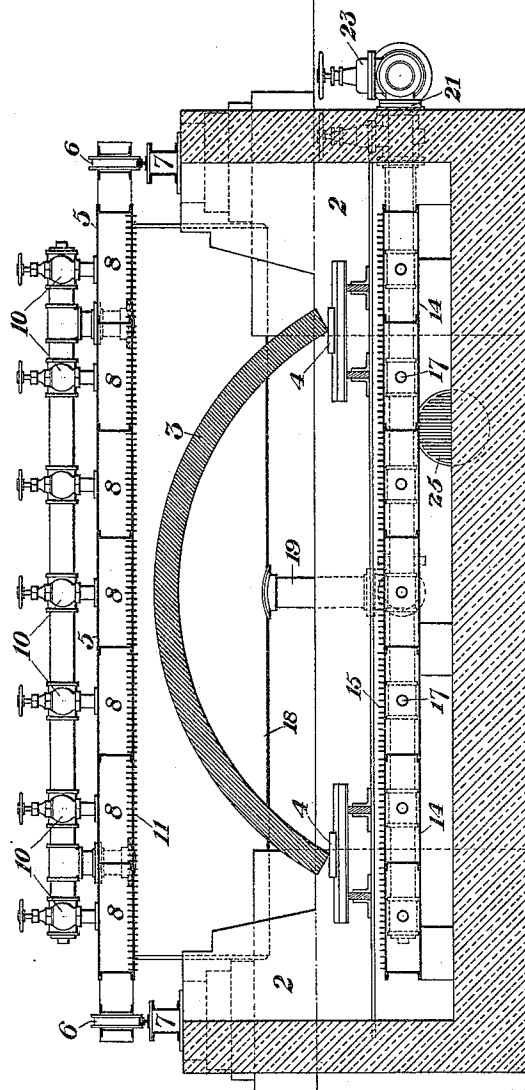


Fig. 2.

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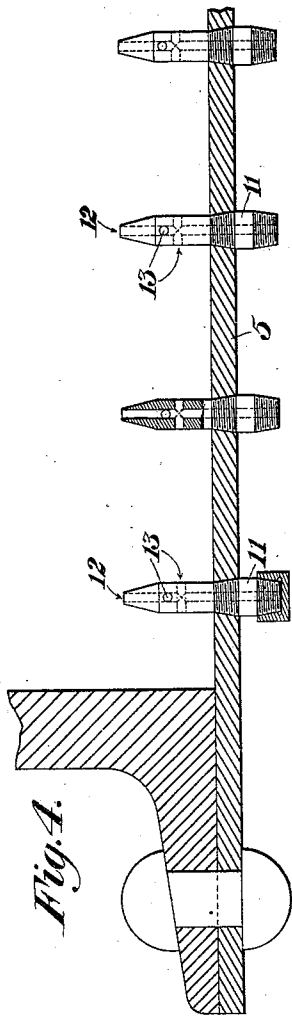
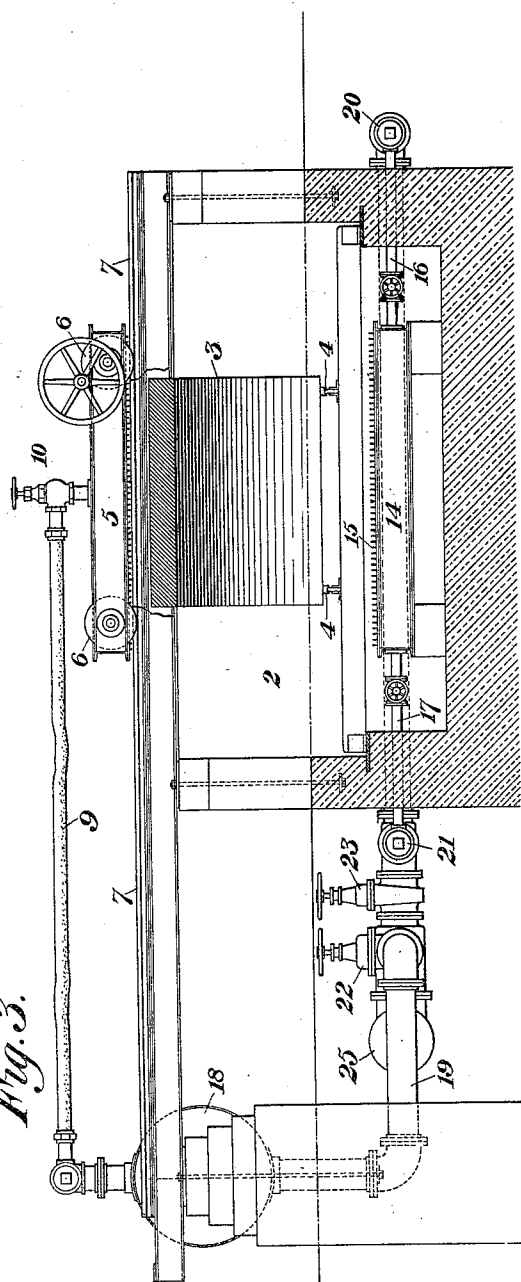


Fig. 3.



WITNESSES

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UNITED STATES PATENT OFFICE

WILLIAM WHIGHAM, OF MUNHALL, PENNSYLVANIA.

HARDENING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 543,973, dated August 6, 1895.

Application filed November 5, 1894. Serial No. 527,877. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WHIGHAM, of Munhall, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Hardening Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, in which—

Figure 1 shows my improved apparatus in top plan view. Fig. 2 is a vertical section thereof on the line II II of Fig. 1. Fig. 3 is a side elevation, partly in vertical section, on the line III III of Fig. 1; and Fig. 4 is a view on a larger scale, showing the spraying-nozzles by which water is discharged from the tank upon the plates to be hardened.

The object of my invention is to provide means for economically and efficiently hardening metal plates, and it is especially applicable to the hardening of curved steel-armor plates and other plates of large size.

In the drawings, 2 represents a chamber in which the metal plate 3 to be hardened is set, being supported therein upon suitable shoes 4, carried upon transverse beams, as shown in Fig. 3, and placed with its convex side uppermost. Above this plate is a tank 5, which is supported on wheels 6 running on a track 7 at the top of the chamber 2, and divided interiorly into a number of compartments 8. Each compartment is supplied with water by a flexible pipe 9. Such pipe may consist of rubber hose, telescope-pipe, or swivel-jointed metal tubes adapted to permit the tank to be moved on its track. Each pipe 9 is controlled by a valve 10, so that water may be admitted into or cut off from any of the compartments of the tank at the will of the operator. The bottom of each compartment is provided with discharge-nozzles 11 having a central longitudinal water-passage 12 and also preferably having cross-passages 13 communicating with the passage 12 within the tank, so as to afford free inlet for the water and to prevent stoppage of the nozzle by accumulation of foreign matter at any one of the inlets. Each of the nozzles is preferably provided at its lower end with an external screw-thread adapting it to be closed by a cap, so that the nozzles not directly above the plate to be hardened may be closed. At the lower part of the chamber 2, below the position of the metal plate,

is a discharge-tank 14, divided into compartments in manner similar to that described with reference to the tank 5, and having at the top upwardly-directed discharging-nozzles 15, which are preferably constructed in the same manner as are the nozzles 11 of the upper tank, but need not extend inwardly within the reservoir.

The tank 14 may be stationary, and into the opposite ends of each compartment thereof lead branch pipes 16 and 17, respectively, from the pipes 20 and 21, thus equalizing the pressure upon the nozzles.

18 is a reservoir from the top of which the pipes 9 lead. 19 is a water-supply pipe extending thereinto from a main pipe 24 and fitted with a valve 22. The main pipe 24 is provided with a strainer 25 to catch coarse particles in the water and to prevent the discharge-nozzle from being clogged thereby, and is connected with the pipes 20 and 21, a valve 23 being employed to open or close said connection.

25 is an outlet for the water used in the operation.

In using the apparatus the metal plate 3, having been heated to the proper degree for hardening, is set in place, as shown in the drawings. The tank 5 is moved on its track so as to bring it directly above the position of the plate to be tempered. The reservoir 18, having been charged with ice through a man-hole 26 in its side, the valve 22 is now opened so as to admit into the reservoir 18 water, which displaces the cold ice-water through the pipes 9 into the compartments of the tank 5, whose valves have been opened, and from the discharge-nozzles of these compartments upon the hot plates, thereby tempering it. The valves of the compartments of the tank 14 opposite to the plate are then opened to the desired degree and water is sprayed from said compartments directly upon the under side of the plate. The use of the valves enables the operator to regulate the flow of the water nicely and to discharge it as required upon the different parts of the plate, so that the operation of hardening and subsequent cooling of the metal is completely within his control. This is of very great importance, because the hardening of such large plates as those used for sheathing war-vessels, &c., is an opera-

tion requiring the greatest skill and care. For example, by an increased supply of water on the upper surfaces the shrinking of a curved plate is controlled so as to lengthen the chord of the arc of curvature, and conversely, by discharging more water upon the under surfaces of the plate, the length of this chord can be decreased.

I claim—

1. Hardening apparatus comprising upper and lower tanks divided by partitions into compartments having discharge nozzles, and means for separately controlling the supply of fluid to each compartment; substantially as described.

2. In hardening apparatus, a horizontally movable tank divided by partitions into separate compartments having discharge nozzles, and means for separately controlling the supply of fluid to each compartment; substantially as described.

3. In hardening apparatus, a horizontally movable tank divided by partitions into separate

compartments having discharge nozzles, and flexible valve controlled pipes leading to each compartment; substantially as described.

4. In hardening apparatus, a tank having inner partitions forming compartments, nozzles in each compartment, and caps arranged to close a portion of the nozzles of a compartment; substantially as described.

5. In hardening apparatus, a tank having inwardly extending nozzles provided with tapered upper ends, to prevent deposition of sediment thereon; substantially as described.

6. In hardening apparatus, a tank having a series of inwardly extending nozzles, arranged to spray a plate and closing caps for the outer ends of said nozzles; substantially as described.

In testimony whereof I have hereunto set my hand.

WILLIAM WHIGHAM.

Witnesses:

H. M. CORWIN,

W. B. CORWIN.