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## HARDENING COMPOSITE PLATES FOR BANK VAULTS.

The manufacture of iron and steel burglar-proof vaults for insurance companies, trust companies and similar institutions is one of increasing importance. As the safe maker advances in his processes, and while he is improving the burglar-proof quality of his safes, so fast does the burglar improve in his method of attack, so that it is often the burglar himself who is in advance of the safe builder.

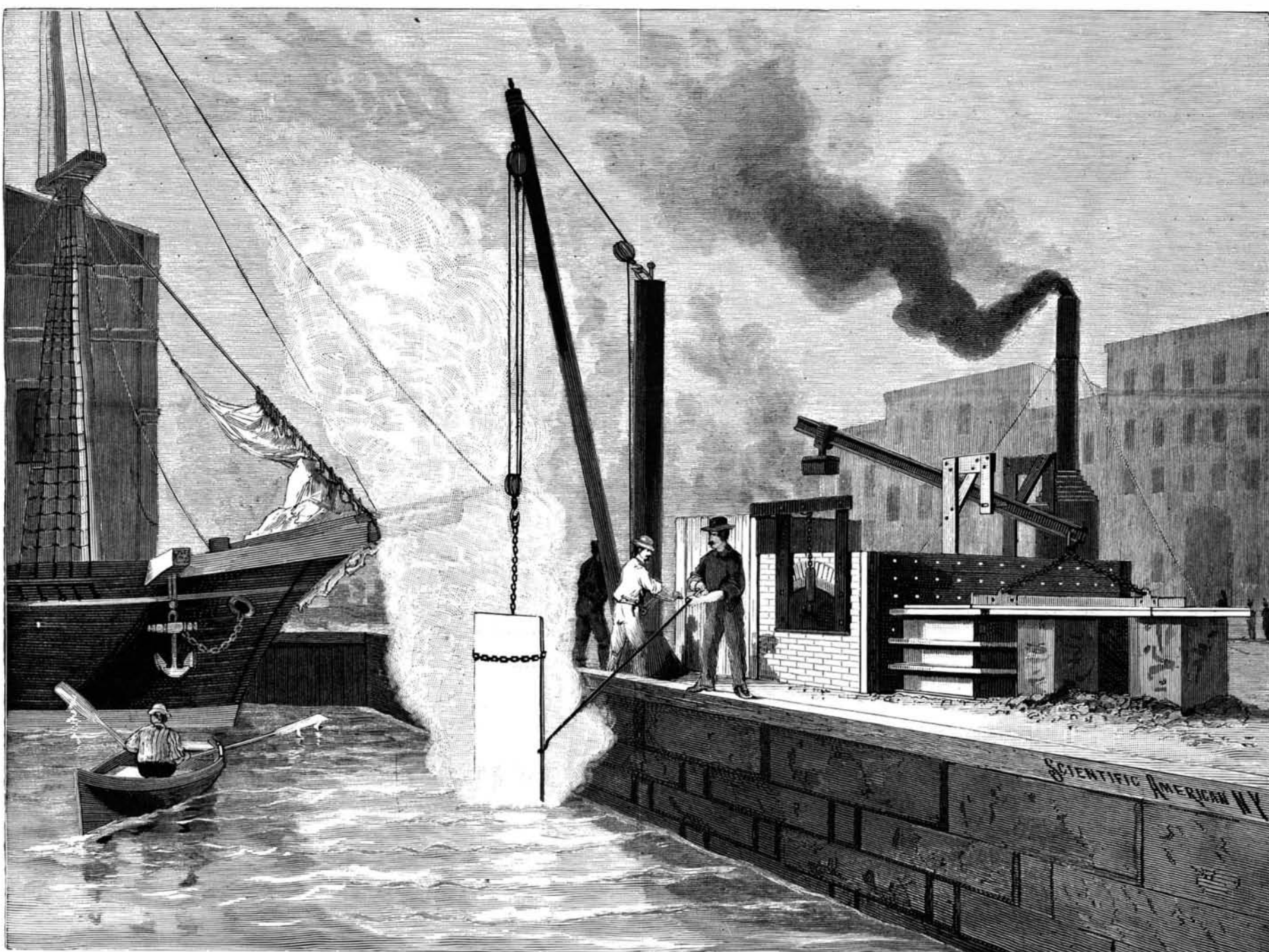
The illustration accompanying this article shows a somewhat curious operation incidental to the manufacture of steel and iron vaults, the hardening of the plates. The process is the one employed at the works of J. B. & J. M. Cornell, in this city, and consists in dipping

layers of soft steel or iron and of hard steel. In the center is a layer of soft steel or iron, next to it come two layers of chrome steel, one on each side, and outside of all are the two layers of soft steel or iron. These plates are rolled of various thicknesses, the different layers welding together, plates one inch thick and one half inch thick being most generally used. For the corners angle irons made of the same material are used.

The safe walls are built up of the composite plates, laid against each other and screwed together. In one usual construction the outside plate is an inch thick. Next to it comes a half inch plate, secured to the outside plate by flat-headed screws, whose heads are

are then removed from the furnaces and as quickly as possible dipped edgewise into the river. In this way they get a salt water hardening. They are then to be rolled cold for the purpose of straightening them. Previous to the heating the blind holes in the one inch plate are stopped with clay to prevent cinders from getting in. After rolling, flattening, and cleaning the plates are ready for shipping and erection.

The object of the combination of hard and soft iron is to secure the safe against attack by sledge or by drill. A drill could hardly be forced through the chrome steel, and at best it is only after many hours' work that the material can be perforated. Again, on account of the soft iron, sledging is without effect, for



HARDENING COMPOSITE PLATES FOR BANK VAULTS BY IMMERSION IN THE HUDSON RIVER.

the hot plates into salt water. Advantage is taken of the water front held by the firm in utilizing *in situ* the salt water of the Hudson River for the purpose, a brine dip being considered superior to one of fresh water. There is unquestionably a difference between the two. The addition of a soluble salt to water raises its boiling point, and to some extent improves its hardening power.

A curious and unique industry in this city is represented in the plant in question. Special heating furnaces are built in the open air upon the margin of the river, and plates of steel heated in them are dipped into the river to harden. Except for docking and shipping purposes, it is about the only technical use made of the river proper.

Curious as is this step of the process, the general manufacture of the vaults is of great interest. They are made of steel and iron. For the walls of vaults a composite plate is used, consisting of five alternate

countersunk in the half inch plates, while their ends screw into blind holes in the one inch plate. The next plate, also a half inch one, is screwed to the second plate in a similar manner except that the tapped holes in the first half inch plates go entirely through. In this way a wall of any desired thickness is built up, one object on constructing it of such thin material being to secure frequent breaking of joints.

The work on the plates, including the drilling and tapping of holes, shaping the edges, etc., has to be done while they are soft. The entire vault is built up of the unhardened plates, each one having its exact place assigned it. The vault is next taken down, piece by piece, and the pieces are hardened. It is this operation which we illustrate. On the edge of the dock on the North River front near the foot of Twenty-Seventh Street in this city reheating furnaces have been built adapted for heating the metal to redness. The plates are put in and are brought to a good red heat. They

even if the hard steel should be cracked, it is so embedded and welded to the adjacent layers of soft iron that no harm is done. In one great vault now building by J. B. & J. M. Cornell for the Equitable Life Insurance Co.'s Boston office as an additional protection, a vault of the construction just described is to be erected within a protecting structure, built up of a special section of 54 pound railroad iron, rolled for the purpose.

A species of cage for the safe is made up of these rails laid interlocking, with their interstices filled with Portland cement. Inside of the rails the steel structure described is made up, the inch plates being first put in position and the half inch plates screwed to their inner surface. The vault is to have two doors, each with its time lock, and moving on ball-bearing hinges. Each time lock has three clocks, any one of which will operate it, so that as long as one clock out of six is in order, the vault will open.