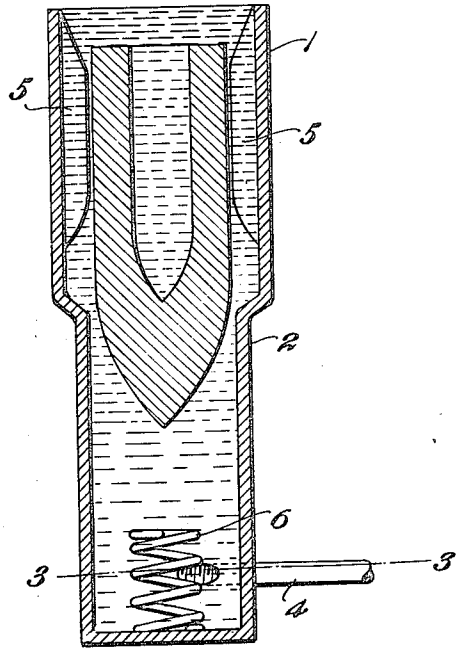
T. F. BAILY & F. T. COPE.

DEVICE FOR QUENCHING STEEL ARTILLERY SHELLS.

APPLICATION FILED JUNE 14, 1918.

1,285,583. Patented Nov. 26, 1918.

Fig. 1.



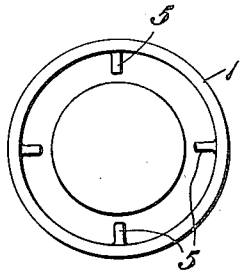


Fig. 2.

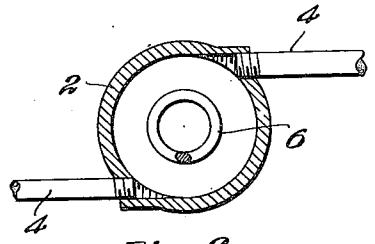


Fig. 3.

INVENTORS,

Thaddeus F. Baily and Frank T. Cope,

BY J. W. Bond

ATTORNEY

UNITED STATES PATENT OFFICE.

THADDEUS F. BAILY AND FRANK T. COPE, OF ALLIANCE, OHIO, ASSIGNORS TO THE ELECTRIC FURNACE COMPANY, OF ALLIANCE, OHIO, A CORPORATION OF OHIO.

DEVICE FOR QUENCHING STEEL ARTILLERY-SHELLS.

1,285,583. Specification of Letters Patent. Patented Nov. 26, 1918.

Application filed June 14, 1918. Serial No. 240,059.

To all whom it may concern:

Be it known that we, THADDEUS F. BAILY and FRANK T. COPE, citizens of the United States, both residing at Alliance, in the county of Stark and State of Ohio, have invented a new and useful Device for Quenching Steel Artillery-Shells, of which the following is a specification.

This invention relates to devices for quenching steel artillery shells after they have been heat treated during the process of manufacture.

The object of this invention is to construct a device of this class that will prevent the shell from becoming scarred while it is still at a high temperature.

Another object is to provide means for more quickly and uniformly cooling the shell after it has been plunged into the quenching water.

With these objects in view the invention consists in the novel construction and arrangement of parts, hereinafter described illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of construction may be made within the scope of the appended claims, without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:

Figure 1 is a sectional view of our quenching device showing a shell in approximately the position it will assume during the quenching process.

Fig. 2 is a top plan view of my device.

Fig. 3 is a section taken on line 3—3, of Fig. 1.

Similar numerals of reference indicate corresponding parts throughout the several figures of the drawings.

In the manufacture of artillery shells, after the shell has been formed it is necessary to heat-treat it for the purpose of producing a desired hardness and texture in the steel. This is especially true in the type of artillery shells known as armor piercing shells. In this type of shells extreme care must be taken to produce exactly the proper texture of steel for the point of the shell. To those skilled in the art it is well known that in the process of heat treating steel, the operation following the heating is known as quenching and consists of taking the steel article that has just been heated to an exact temperature and suddenly plunging it into water, oil or other cooling medium. This quenching must also be done accurately so that the proper grain and texture will be produced in the steel article. Various types of devices are now being employed for this quenching process in the manufacture of artillery shells but various defects exist in these devices which cause them to produce a relatively high percentage of imperfect shells, a common failing in most of the devices being a construction which demands that the shell be dropped point first upon a moving carriage. It is obvious that the extremely high temperature of the shell at the instant that it is dropped causes the steel to be more or less softened and the impact occasioned by the contact with the carrier frequently mars the armor piercing point and renders the shell unfit for use.

In our invention we have constructed a cylindrical tank shown at 1, the lower portion of which is reduced as at 2. Entering the reduced portion 2 at a point near the bottom thereof is a pair of inlet pipes 4 which enter the cylinder as shown in Fig. 3.

Extending inwardly from the upper portion of the cylinder are fins or vanes 5 which are tapered at their upper ends as shown and leave an open space at the center of the cylinder only a very little bit greater in diameter than the diameter of the shells to be used with the device.

Through the inlet pipes 4 will be forced water under high pressure and by reason of the location and arrangement of the said inlet pipes it is obvious that the water entering the cylinder will begin to swirl. The high pressure of the water will cause it to rise rapidly within the cylinder. When the water has begun to overflow the top of the cylinder the device is ready for the shell to be dropped for the quenching process. The shell entering the upper end of the cylinder point downward as shown in the drawings will meet the current of water rushing upward through the cylinder which causes the speed of its travel to be materially checked so that it moves downward toward the position shown in Fig. 1 slowly. It will now be noted by reference to the drawings that the diameter of the reduced portion of the cylinder is very slightly greater than the di-

ameter of the shell. It will thus be seen that when the shell reaches the position shown in Fig. 1, it will have virtually closed the outlet passage for the water and as previously pointed out the water being under high pressure will force the shell to ascend slightly, which obviously enlarges the outlet opening since the forward end of the shell is tapered. The pressure of the water having now been slightly reduced by the escapement of a part thereof past the sides of the shell, the shell will once more begin to settle downwardly in the cylinder and reaching again the point shown in Fig. 1 prevents the escape of the water and thus increases the pressure in the lower part of the cylinder. It is thus seen that this action will virtually keep the shell suspended in the water, the vanes 5 meanwhile preventing the shell from tilting out of vertical position. The high pressure of the water passing in through the pipes 4 will cause a large volume of water to rush upward through the cylinder and past the shell. It will thus be seen that the shell will be more quickly and thoroughly quenched than would be the case where the type of devices using the spray quench are employed.

If, for any reason the water pressure entering through the pipes 4 should fail, in order that the shell if not sufficiently cooled shall not drop to the bottom of the cylinder and thus become marred, we secure in the bottom at the exact center of the cylinder a heavy cushioning spring 6, which will serve to catch the shell and break its fall.

While the operation of our device describes the use of water as a cooling medium it is obvious that oil, brine or any other well known cooling medium could be employed in the same manner.

Having fully described our invention what we claim as new and desire to secure by Letters Patent, is:

1. In a shell quenching device, a cylinder of slightly larger diameter than the shell to be quenched, water inlets adjacent the bottom of said cylinder and designed to admit water to the said cylinder under sufficiently high pressure to prevent the said shell from reaching the bottom of said cylinder.

2. In a shell quenching device, a cylinder having a reduced lower portion, the said reduced portion being slightly larger in diameter than the shell to be quenched, water inlets adjacent the bottom of said cylinder and designed to admit water under high pressure, the water entering said pipes being designed to create a pressure within the said cylinder and to prevent a shell entering the said cylinder from the top from reaching the bottom of said cylinder.

3. In a device of the character described, a cylinder designed to have dropped therein a shell, the lower portion of said cylinder being reduced to the approximate diameter of the said shell, water inlets adjacent the bottom of said reduced portion and designed to admit water under pressure sufficiently great to prevent the said shell from reaching the bottom of the cylinder and vanes arranged about the interior of the said cylinder adjacent its upper end and designed to hold the said shell in vertical position and a spring secured to the bottom of the said cylinder and designed to catch the said shell should the water pressure fail.

4. In a shell quenching device, a cylinder adapted to have dropped therein a shell to be quenched, inlets adjacent the bottom of said cylinder adapted to admit a cooling medium at sufficiently high pressure to prevent a shell dropped into the cylinder from reaching the bottom of said cylinder.

In testimony that we claim the above, we have hereunto subscribed our names.

THADDEUS F. BAILY,
FRANK T. COPE.