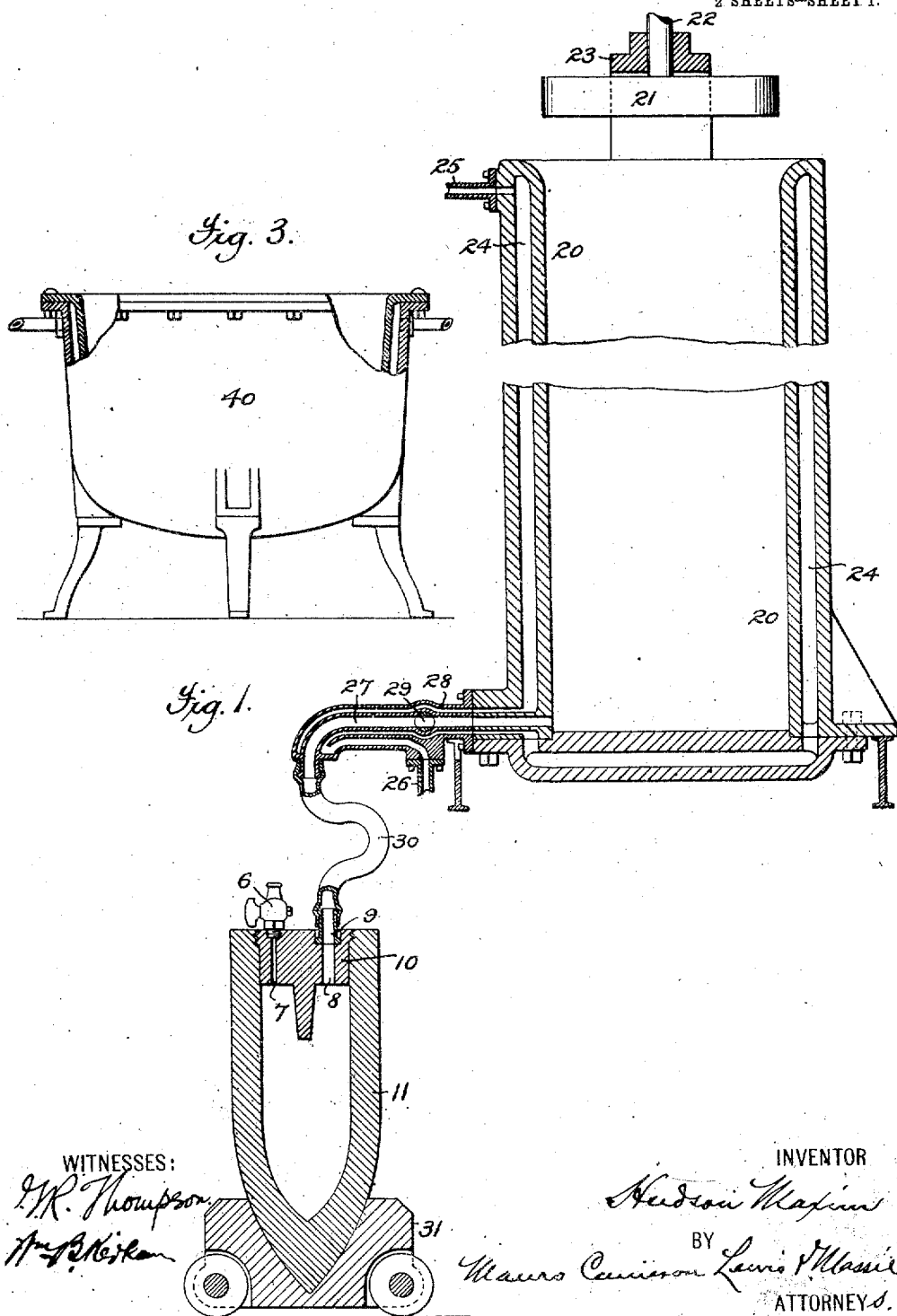


H. MAXIM.
 APPARATUS FOR CHARGING OR LOADING PROJECTILES WITH HIGH EXPLOSIVES.
 APPLICATION FILED MAY 12, 1904.

988,798.

Patented Apr. 4, 1911.

2 SHEETS—SHEET 1.



WITNESSES:

J. R. Thompson
H. B. Ketchum

INVENTOR

Hudson Maxim

BY

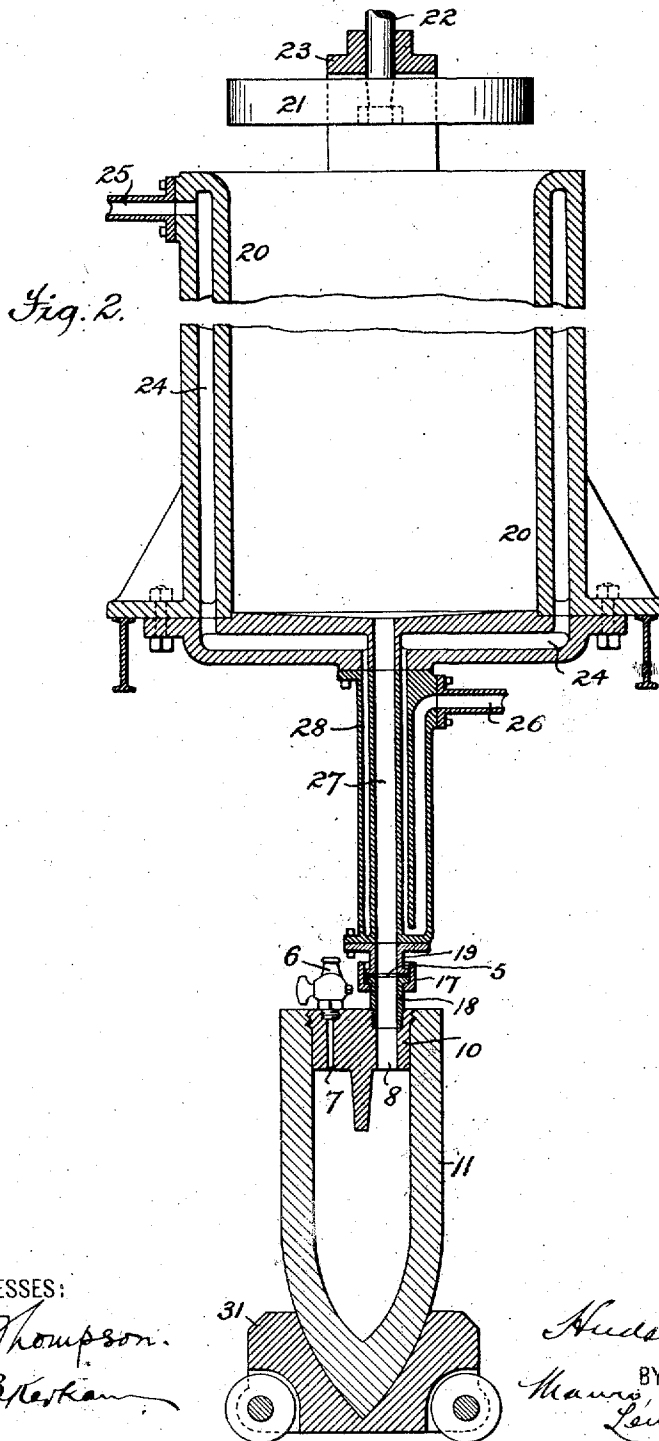
Maurice Cameron Lewis & Massie
 ATTORNEYS.

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G. R. Thompson.
H. B. Haskin.

INVENTOR

Hudson Maxim

BY *Cameron,*
Lewis & Massey
 ATTORNEYS.

UNITED STATES PATENT OFFICE.

HUDSON MAXIM, OF NEW YORK, N. Y.

APPARATUS FOR CHARGING OR LOADING PROJECTILES WITH HIGH EXPLOSIVES.

988,798.

Specification of Letters Patent.

Patented Apr. 4, 1911.

Application filed May 12, 1904. Serial No. 207,711.

To all whom it may concern:

Be it known that I, HUDSON MAXIM, of the borough of Brooklyn, city of New York, State of New York, have invented a new and useful Improvement in Apparatus for Charging or Loading of Projectiles with High Explosives, which invention is fully set forth in the following specification.

The present invention relates to a novel apparatus for the more rapid, economical and efficient charging or loading of projectiles with high explosives than heretofore.

The object of the invention is mainly to provide a process and apparatus by which a high explosive in a fused or plastic or semi-fluid state may be charged into projectiles with ease and rapidity, and at the same time securing a solid or non-porous charge—that is to say, a charge free of air bubbles or air spaces.

In carrying out the invention a vertically arranged feeding cylinder or chamber, preferably a hydraulic compression cylinder, is provided, and constructed so that the plunger may be lifted free of the top of the cylinder, to provide space for the convenient charging of the cylinder with the explosive material as it is required. Connected with the lower end of the feeding or explosive supply cylinder is an outlet conduit which may be wholly or partially flexible or jointed to facilitate connection with the projectile to be filled. The supply cylinder and preferably also the outlet pipe or conduit are water-jacketed, and means are provided for the circulation of hot water through this jacket to maintain the explosive in its proper or desired fused or plastic condition. Of course, steam may be employed instead of hot water, but hot water is preferably employed.

In filling projectiles, a false or temporary base plug having the configuration of a true base plug is first screwed into the projectile. This base plug is provided with an inlet opening having means adapting it to be connected with the outlet pipe of the explosive supply chamber, and a vent is also provided for the escape of the air as the projectile is being charged or loaded with

the explosive. A pet cock may also be attached to the vent.

The explosive material which I prefer to employ is that which by the fusion of one of the ingredients in which a non-fusible ingredient is suspended, forms a paste, plastic in nature, of the consistency of thick pea-soup, and capable of flowing freely under pressure, the fusible ingredient melting easily in the water bath. The high explosive may be either melted or rendered plastic in a steam-jacketed kettle, or over a water bath, and then charged into the supply cylinder in that condition, or the material may be charged into the supply cylinder in powdered form, and there be fused or rendered plastic by the heat of the hot water jacket with which the cylinder is surrounded. When the cylinder is charged for use, the plunger is admitted into and closes the upper end of the cylinder. The false base plug having been inserted in the end of a projectile, is then attached to the outlet pipe, and the material in the supply cylinder is subjected to pressure by forcing down the plunger upon it, whereby the plastic explosive is forced outward through the exit pipe and down into the chamber of the projectile with great force, the air being expelled through the vent. In this way the projectile is very quickly charged or loaded, with the avoidance of all air spaces. When the projectile is full and the escape of air ceases at the vent or on the appearance of escaping explosive material through the vent, the cock in the vent is shut off, and the valve or plug cock in the supply pipe is also shut off, or the downward pressure of the plunger is stopped, or both the plug cock is shut off and the pressure of the plunger stopped and the further supply of material stopped. The outlet or supply pipe is disconnected from the charged or loaded projectile and connected with the false base plug of another projectile to be charged or loaded and the operation repeated. On cooling, the explosive in the projectiles charged in this way solidifies into a dense and very hard mass, adhering tightly to the walls of the projectiles, and completely filling the space

within the same, thus preventing the possibility of the shifting of the explosive charge or any part of it in the projectile on firing from a gun or in the penetration of armor plate.

The accompanying drawings illustrate a practical embodiment of the invention, in which—

Figures 1 and 2, are vertical central sectional elevations of different forms of the improved apparatus; and Fig. 3 is a sectional elevation of a steam-jacketed kettle for preparing the explosive mixture for use.

The improved apparatus consists of a vertically arranged compression cylinder or supply chamber 20, provided with a vertically moving piston plunger 21, adapted thereto and operated by any suitable power through its rod 22, shown passing through a suitable bearing 23. The piston plunger 21, has sufficient upward travel above the open end of the supply chamber to permit the ready supply of the explosive material thereto. The cylinder or chamber 20 is formed with a hollow jacket 24 through which a circulation of preferably hot water is maintained by a feed pipe 25 and passing outward by a pipe 26. The chamber is provided with an outlet pipe or conduit 27 also formed with a hollow jacket 28 in communication with the hollow jacket of the chamber by which the plasticity of the material passing outward through said pipe is maintained to insure it flowing under pressure into the projectile being loaded. In Fig. 1 the outlet pipe 27 communicates with the side of the supply chamber near its bottom and is provided with a plug valve 29 by which the supply through the pipe may be shut off when desired as when one projectile has been loaded and the pipe is to be disconnected therefrom and connected to another projectile. In this form of the apparatus the end of the outlet pipe 27 is continued by a flexible tube 30, having a screw-threaded or other suitable nipple, 9, for attachment to a false base plug 10. The flexible continuation of the outlet pipe may be of sufficient length to enable the attendant to have some range of movement in connecting and loading a number of projectiles placed in proximity to the apparatus. This false or temporary base plug 10 partakes of the configuration of a regular base plug, and is screw-threaded, as is the regular one, into the open end of the projectile 11. The base plug, in addition to the passage 8 for the supply of the explosive, has an air vent 7 which may be controlled by a pet-cock 6. For convenience of moving the projectiles into position to be charged or loaded, and then moved away, they may be carried by a small wheeled or other truck 31.

A number of false or temporary base plugs will be provided so that the process of load-

ing projectiles may continue for any desired period, so that only sufficient interruption in loading to disconnect and connect the attaching nipple need occur.

In the construction shown in Fig. 2, the outlet pipe 27 communicates vertically through the bottom of the supply chamber 20, and is rigid throughout its entire length. Its lower end has a flanged nipple 19 arranged for attachment to a similar nipple 18 of the base plug passage 8 by a coupling sleeve 17 with an interposed washer 5.

The means of connecting the outlet pipe 27 with the projectile may obviously be of any suitable form, those shown being mere examples of a screw-threaded or bayonet jointed connection, the latter form being preferred. By directly connecting the cavity of the projectile with the supply chamber the explosive material may be forcibly expelled from the chamber into the cavity of the projectile whereby at the time the projectile is full, the charge is under the same compression as material in the chamber, whereupon the vent cock will be closed and the supply be cut off by closing the plug valve 29, or by stopping the compression movement of the plunger or both.

The explosive material employed is preferably one capable of being rendered plastic by heat and of forming a solid compact dense mass on cooling. Such a material may be prepared in a hot water or steam-jacketed kettle 40, as indicated in Fig. 3, from which the plastic or fused material may be dipped into the supply cylinder 20. Or the explosive material may, in the first instance be fed to the cylinder or chamber and by the heating medium surrounding it be rendered and maintained in a plastic or fused condition ready to be forced outward and compressed into the projectiles.

The process set forth in this application is not herein claimed, the same forming the subject-matter of application Sr. No. 329,778, filed Aug. 8, 1906, a division of the present case.

What is claimed is:—

1. The combination of an explosive supply chamber, means for exerting pressure therein, means for heating said chamber, and an outlet conduit having means for attachment to the base plug of a projectile to be charged.

2. The combination of an explosive supply chamber, means for exerting pressure therein, an outlet conduit having means for attachment to the base plug of a projectile to be charged, and means for circulating a heating medium around the chamber and outlet conduit.

3. The combination of an explosive supply chamber, means for exerting pressure therein, an outlet conduit terminating in a flexible portion, having means for attach-

ment to the base plug of a projectile to be charged.

4. The combination of means for forcing a plastic explosive under pressure through a conduit, and a false base plug for a projectile having means adapting it for attachment to said conduit, and also having a vent.

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

HUDSON MAXIM.

Witnesses:

WILLIAM E. HILLS,
R. L. SCOTT.