G. W. GENTIEU.

PROJECTILE LOADING.

APPLICATION FILED APR. 9, 1906.

**899,523.**

Patented Sept. 29, 1908.

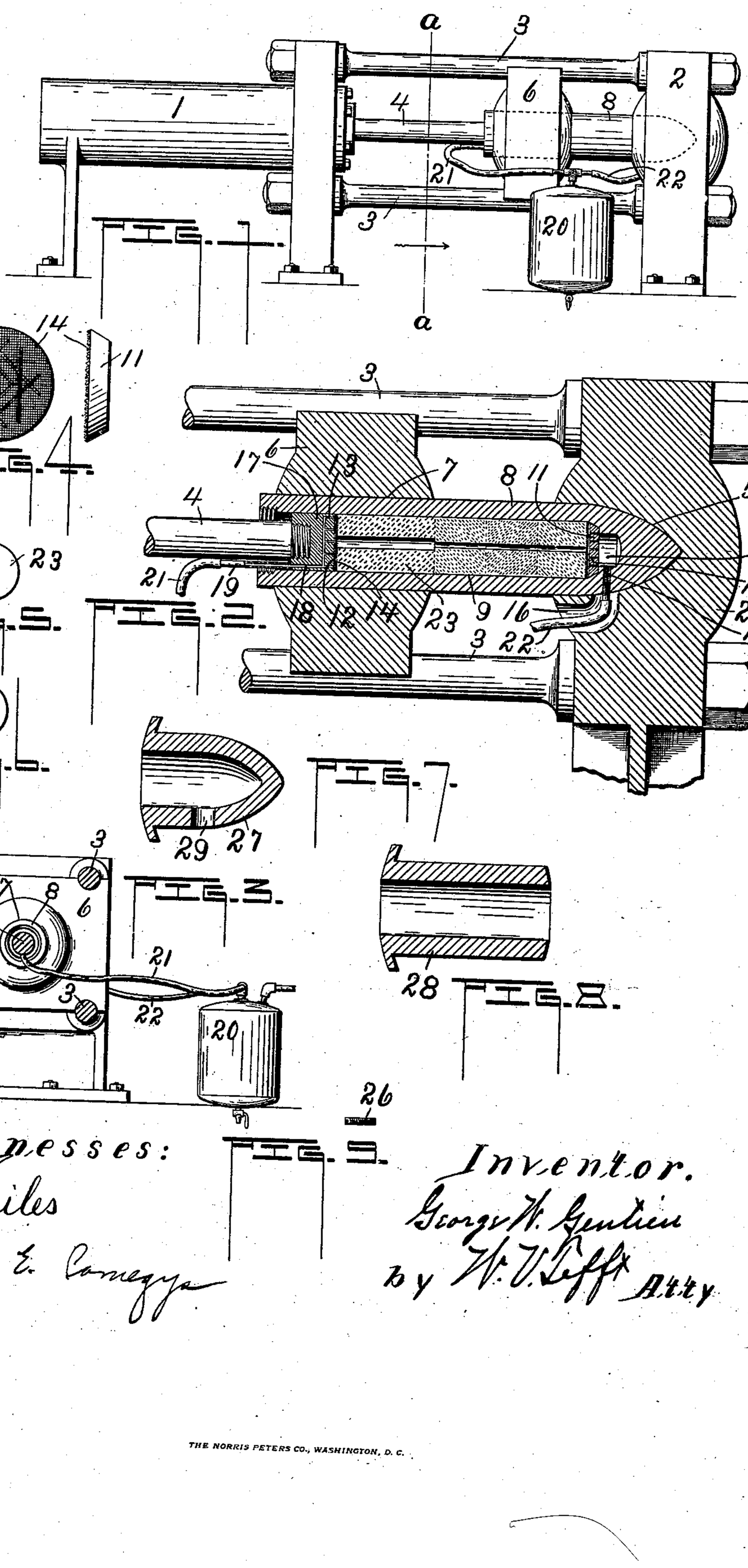


FIG. 1.




FIG. 4.

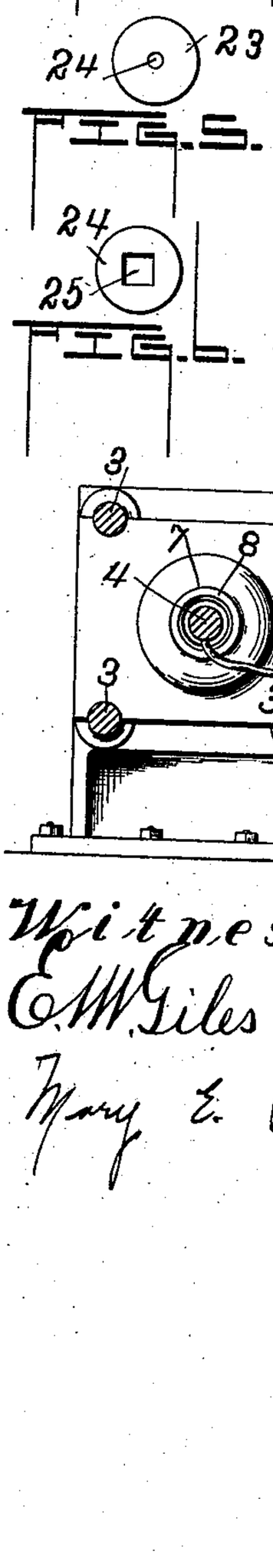


FIG. 5.




FIG. 2.




FIG. 7.




FIG. 3.




FIG. 8.




FIG. 6.

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# UNITED STATES PATENT OFFICE.

GEORGE W. GENTIEU, OF PEORIA, ILLINOIS.

## PROJECTILE-LOADING.

No. 899,523. Specification of Letters Patent. Patented Sept. 29, 1908.

Application filed April 9, 1906. Serial No. 310,622.

*To all whom it may concern:*

Be it known that I, GEORGE W. GENTIEU, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Projectile-Loading; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference more particularly to improvements in the art of loading projectiles with nitro-cellulose or other similar explosive, which detonates from shock or pressure.

It is very important in explosive projectiles that are hurled or thrown with a revolving motion that the inclosed explosive be so held therein that the rotation which is imparted to the projectile shell is immediately imparted to the mass of explosive contained therein. This is necessary from the fact that unless the motion of the projectile shell is immediately imparted to the explosive, the friction of the projectile shell revolving about the explosive is often great enough to create sufficient heat to prematurely explode the charge. This may be accomplished by firmly pressing the explosive into the projectile and in using explosives such as nitro-cellulose, which detonate from shock or pressure, it is necessary to provide some method whereby the charge may be firmly pressed into the projectile without danger of explosion. I accomplish this object in my invention by using thoroughly wet explosive, compressing the same in the projectile to the required density and drawing off the liquid from the interior of the shell as it is pressed out of the explosive.

In the accompanying drawings, which illustrate one form of apparatus for carrying out my invention and in which similar reference characters indicate similar parts in the several views, Figure 1 is a side elevation of the complete apparatus in the operation of loading a projectile; Fig. 2 a vertical longitudinal sectional view of the right hand end of the apparatus shown in Fig. 1; Fig. 3 a vertical cross sectional view on the line *a*—*a* of Fig. 1, looking as indicated by the arrow; Fig. 4 a face and an edge view of the strainer plate against which the explosive is compressed in the projectile; Figs. 5 and 6 end views of blocks of explosive with which the projectile is loaded; Figs. 7 and 8 bushings such as may be used to adapt the apparatus shown herein for loading projectiles of various sizes; and Fig. 9 the threaded plug which is used to close the drain opening in the head of the projectile.

1 is a hydraulic cylinder in front of which and suitably distanced therefrom is a head block 2 which is connected by a number of parallel tie rods or beams 3 to the frame of the cylinder. This head block is provided on its inner face and in line with the piston 4 of the cylinder with a cavity 5 adapted to receive the head of the projectile to be loaded, and mounted on and slidable on the tie rods or beams 3 intermediate of the cylinder 1 and the head block 2 is a guide block 6 provided with an opening 7 in line with the cavity 5 of the head block, said opening being adapted to receive the rear end of the projectile and support the same during the operation of loading. The projectile 8 may be of any suitable construction and is shown herein in the operation of being loaded or receiving the charge of explosive therein. This projectile is provided with the customary chamber or bore 9 extending lengthwise thereof for containing the explosive and said explosive chamber terminates at the forward end or head in the chamber or cavity 10, preferably of smaller diameter than the explosive chamber, from which it is separated by means of a strainer plate 11, which said strainer plate is provided on the surface facing the explosive chamber with a number of channels or grooves 12 communicating through openings 13 with the chamber 10. This strainer plate forms the head against which the explosive is compressed and has a wire mesh fabric covering 14, preferably of brass, on the face thereof next the explosive chamber, through which the liquid is drained from the explosive as it it is pressed into the projectile. There is also provided a threaded opening 15 communicating with the chamber or cavity 10, through which the liquid is drained from said cavity as it is pressed out of the explosive, and the head block 2 is constructed with an opening or cavity 16 so that the drain tube can be connected to said opening 15 of the projectile when it is in position in the press.

As can readily be seen, the projectile when positioned as shown in the drawings has the

open end thereof facing and in line with the piston rod 4 of the press and said piston rod is provided with a ram head 17 adapted to operate within the bore or explosive chamber of the projectile for compressing the explosive therein and said ram head is provided similarly to the strainer plate 11 with the openings or grooves 12 on the face thereof, which communicate through openings 13 in said head with the common outlet 18 and tubular extension 19, through which the liquid is exhausted, and has a wire mesh fabric covering 14 on the face thereof.

To facilitate drawing off the liquid from the explosive chamber, suction mechanism may be provided, such as the vacuum tank 20, which is connected by means of the flexible tube 21 with the tubular extension 19 of the ram head and by means of the flexible tube 22 through the opening or cavity 16 in the head of the press with the opening 15 in the head of the projectile.

My invention is described herein in the operation of loading a projectile with nitro-cellulose, as this is the most desirable explosive for use in explosive projectiles. Nitro-cellulose, as is well known, is very dangerous to handle in a dry state but when wet is perfectly safe and may be compressed without danger. In loading the projectile, I use thoroughly wet nitro-cellulose and preferably form or mold the same into cylindrical blocks 23 somewhat smaller in diameter than the explosive chamber of the projectile. These blocks 23 of nitro-cellulose are compressed to about one half the desired density in the preliminary press and each is provided with a centrally arranged opening 24 extending longitudinally through the same. These blocks are taken directly from the press before they have time to dry and are compressed in the projectile.

In the operation of loading a projectile in accordance with my invention, the shell 8 of the projectile is placed in position in the press as shown, the strainer plate 11 placed in position in the forward end of the explosive chamber and the tubular extension 19 of the ram head and the opening 15 in the projectile connected with the vacuum tank 20. A block of wet nitro-cellulose of a suitable degree of nitration and of standard stability test, which has been formed in the preliminary press and which has not had time to dry, is then placed in position in the explosive chamber, the walls of which have been previously coated with some good lubricant insoluble in water and having no chemical action on the nitro-cellulose. I prefer to use some lubricant which is gradually absorbed by the nitro-cellulose after the projectile has been loaded or some lubricant which, after the operation of loading has been completed, becomes gummy and acts as a cement, binding the mass of explosive tighter in the projectile. Lubricants of this character are well known, specific examples being found in Patents 282,648, 562,291, 317,940, 366,386 and a number of others. In the present case such lubricant is in the nature of a compound consisting preferably of 50% tallow, 25% beeswax and 25% vaseline. The press and vacuum devices are then set in operation and as the ram head advances in the explosive chamber, the block of explosive is compressed against the strainer plate and the surplus liquid remaining in the nitro-cellulose drawn off through the tubes 21 and 22 into the vacuum tank as it is pressed out of the explosive.

The block of wet nitro-cellulose from the preliminary press does not readily change its form, consequently the hole or opening 24 through the block of nitro-cellulose is not destroyed by the compression, but is merely reduced in diameter. As the block of nitro-cellulose is compressed it expands somewhat, binds against the wall of the explosive chamber and is thereby firmly fastened in the projectile.

The first block of explosive having been pressed into place, the ram head 17 is withdrawn from the projectile by reversing the press, the central opening 24 in the compressed explosive carefully cleaned out and additional blocks of nitro-cellulose pressed into the explosive chamber in the same manner as the first, until the chamber is filled.

The opening or perforation 25 in the last block of explosive is made much larger than the openings 24 in the others so as to provide the necessary space for the insertion of a detonating primer of fulminate and dry nitro-cellulose. This opening 25 is preferably square or otherwise constructed so as to hold the primer in the block of explosive against separate movement. After the explosive chamber 9 has been completely filled and the primer placed in position, the rear end of the projectile is closed by means of the usual breech cap.

The cavity or chamber 10 in the head of the projectile, which served in the operation of loading to collect the liquid as it was expelled from the explosive, may be filled through the threaded opening 15 with some explosive or with some material such as resin, for producing a large quantity of smoke to indicate to the gunner the spot where the projectile exploded and to confuse the enemy. After this cavity has been filled, the opening 15 is closed by the threaded plug 26, the outer end of which is filed smooth with the surface of the projectile.

The openings 24 through the blocks of nitro-cellulose, which, in the operation of loading the projectile, form a channel for the exhaust of the liquid as it is pressed out of the explosive, in the loaded projectile, form a passageway from the primer to the

strainer plate for the propagation of explosive waves, thus effecting a complete explosion of the entire charge.

For the purpose of adapting the press herein shown for loading projectiles of various sizes, there are provided bushings 27 and 28 for the head block and guide block respectively, which fit within the openings thereof. The bushing 27 for the head block has an opening 29 adapted to coincide with the opening 16 in the guide block to permit communication of the exhaust tubes with the head of the projectile.

What I claim is:

1. The method of loading projectiles, mines, etc. by compressing wet explosive in the explosive chamber thereof and exhausting the liquid from said chamber as it is pressed out of the explosive.

2. The method of loading projectiles, mines, etc. which consists in forming wet explosive into blocks in a preliminary press or mold, then taking the said blocks of explosive while thoroughly wet from the preliminary press and before they have time to dry, compressing them in the explosive chamber of the projectile, mine, etc.

3. The method of loading projectiles, mines, etc. with an explosive which detonates from shock or pressure, which consists in coating the walls of the explosive chamber with a lubricant non-soluble in water, and having no chemical action on the explosive, then introducing thoroughly wet blocks of the explosive of less than the required density into the explosive chamber, compressing the said blocks of explosive in said explosive chamber to the required density and drawing off the water from said chamber as it is pressed out of the explosive.

4. The method of loading projectiles, mines, etc. which consists in forming wet explosive into blocks of less than the required density, in a preliminary press or mold, and constructing passageways through the said blocks of explosive, then introducing the said blocks of explosive while thoroughly wet into the explosive chamber of the projectile, mine, etc. and compressing the same therein to the required degree of density.

In testimony whereof I have affixed my signature, in presence of two witnesses.

GEORGE W. GENTIEU.

Witnesses:

E. M. GILES,

MARY E. COMEGYS.