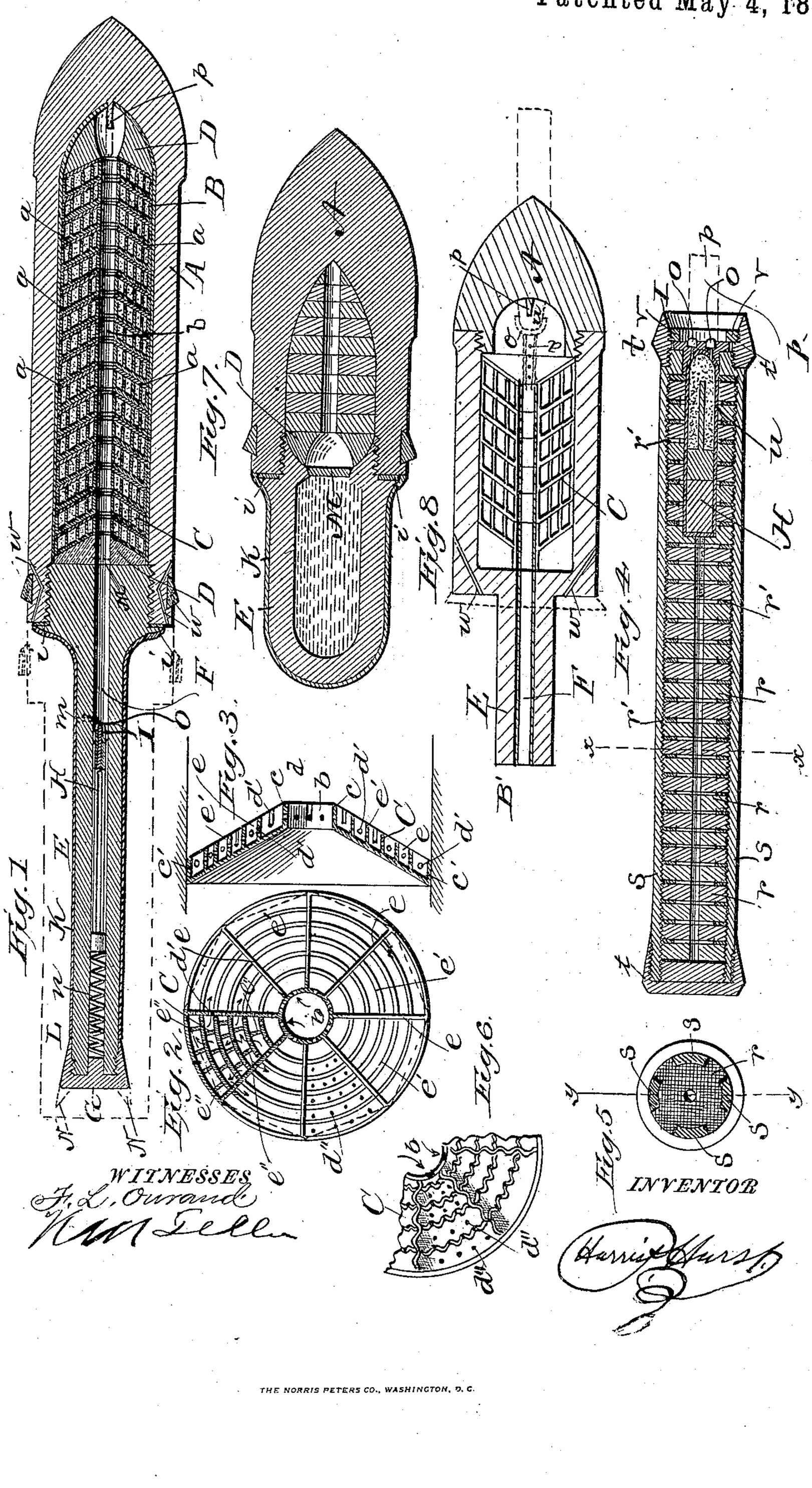
(No Model.)

H. P. HURST.

HIGH EXPLOSIVE SHELL AND FUSE.

No. 582,063. Patented May 4, 1897.



UNITED STATES PATENT OFFICE.

HARRIS P. HURST, OF SUMMIT, MISSISSIPPI.

HIGH-EXPLOSIVE SHELL AND FUSE.

SPECIFICATION forming part of Letters Patent No. 582,063, dated May 4, 1897.

Application filed June 10, 1896. Serial No. 595,010. (No model.)

To all whom it may concern:

Be it known that I, HARRIS P. HURST, a citizen of the United States, residing at Summit, in the county of Pike and State of Mississippi, have invented certain new and useful Improvements in High-Explosive Shells and Fuses; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to shells for high-power guns, and particularly for high-explosive shells and the fuse for exploding or detonating the explosive to be used therein as a bursting charge, and the method and means of isolating detonator and explosive and fulminate or detonator or primer and fulminate.

The objects of the invention are, first, to so charge the shell as to reduce the danger of explosion by shock to the minimum, and, second, to arrange a fuse to explode and detonate the same only when the shell has left the gun, and then by impact; but a modification with the time-fuse arrangement can be added, if desired, without altering the general design.

Referring to the drawings accompanying this description and specification, Figure 1 represents a longitudinal section of the shell charged and fused. Fig. 2 is a transverse section of one of the subdivided explosive-holding safety racks or boxes shown in Fig. 1. Fig. 3 is a longitudinal section of Fig. 2. Fig. 4 is a longitudinal section view of the fuse shown in Fig. 1. Fig. 5 is a cross-section of Fig. 4 on line *x x*. Fig. 6 is a modification of Fig. 2. Figs. 7 and 8 are modifications of Fig. 1.

Reference-letters are used to designate the various parts.

The body of the shell A may be of any desired form and of any suitable material, as steel. The explosive-chamber may be of various shapes and may be provided with an asbestos, felt, wax, or other suitable liner B. When the shell is charged with an explosive packed in the safety-racks C, an elastic or unyielding cushion D, which may be an explosive, is placed at the top and bottom of the shell-cavity, and elastic or unyielding covers *a a a*, which may be of explosive material, are placed between each of the racks C, cover the explosive in the open rack C, and are arranged so as to take up and diminish shock when the shell is fired.

The cushions and covers may have a fuse-hole through the center and be made of any suitable material.

The racks C may be made of metal or other suitable material of many forms, as shown in Figs. 2, 3, and 6. They may be called "inverted" saucers, either round or octagonal, (see dotted lines, Fig. 2,) the latter form probably preferable, as it would prevent rotary motion when desired within the shell when it is fired from a rifled gun. Each of these racks may have a central fuse-hole *b*, and the raised neck or inner wall *c* around this opening is provided with holes or channels *d*. The outer edge of the rack has a rim *c'* of equal height with the central neck or wall *c*, and extending from neck or wall *c* to rim *c'* are sectional partitions *e e e*, and from partitions *e e e* extend other partitions *e' e' e'*, and across partitions *e' e' e'* are additional partitions *e'' e'' e''*, and through each of these partitions are slits, holes, or channels *d'*, so arranged that when an explosive is packed into a rack or holder every subdivision of the racks is in communication with every other subdivision, so that when one is exploded or detonated all will explode or detonate.

The bottom of the rack C and the covers *a a a* may have perforations *d''* in them over and under each of the subdivisions, so as to make every compartment within the series of racks or holders subject to explosion or detonation by the explosion or detonation of the explosive in any one compartment of any one of the series of racks in the shell.

When the shell is packed, each of the racks should fit snug, and the shape shown, with the various partitions, give great strength and prevents the crushing of any one or any part of one of the racks when fired, making the shell proof against explosion from shock. The incline of the racks may be of any degree, and they may be inverted in loading, as shown in Fig. 8, their inner necks or walls forming, if desired, a continuous tube through the shell, or the racks may be supported on a central tube or rod, (shown in Fig. 8, dotted lines,) and left free to rotate thereon when fired.

The shell has integral with it a subcaliber

rear extension E and is loaded from the front with the head of the shell screwed on, Fig. 8, or it may be charged from the rear, as shown in Fig. 1, and the rear extension-piece is screwed onto the base of the shell, or both the base and the head may be screwed onto or into a hollow cylindrical central portion, and the packing *i*, of soft metal or other material, may be placed between the head of the screw-plug or flange on the forward end of the extension-piece and on the head of the shell to prevent the inflow of gas when the shell is fired from the gun.

The rear extension E of the shell may be of full or sub caliber and has a hole or fuse-channel F through its center, in some cases from end to end. This hole or fuse-channel may have an asbestos, felt, or wax or other liner B′, Fig. 8. The diameter of the fuse-channel should be about the same as the fuse-hole *b* in the explosive-racks C. The rear of this fuse-channel may be closed by a cap or screw-plug G. When the shell is ready to be placed in the gun, the plug G is removed and the fuse H is inserted and the plug replaced. It is the intention to keep the fuse separate from the shell until the latter is ready to be placed in the gun for firing.

The fuse H is tubular or solid and is prevented from forward motion by the pin *m* and from rearward motion by the coiled wire *n*, which may be attached to the rear end of the fuse or be separate from it.

When the fuse and coiled wire are separate, as shown in Fig. 1, a rod runs backward from the fuse H, and has a head which snugly fits the fused channel O, and has the coiled wire *n* attached to it. This head constitutes a follower or tamping device at the rear of the fuse, thereby giving weight to the latter and insuring detonation; also, the rear head *t′* of the fuse performs the same function.

When the shell is fired, the coiled wire is compressed and takes up the shock on the fuse, which may be composed of any suitable material to suit the particular explosive used in the shell. Preferably the wire should be untempered, and when compressed remain so, leaving the fuse at the farthest point possible from the explosive-chamber of the shell.

The fuse could be attached to the wire and the wire to the plug G, and this would hold it in position, or other means, such as friction, could be used to have the fuse remain at the rear end of its channel, when thrown there by the shock in firing, until the shell strikes, when the shock of impact, whether on water, land, or the deck or side of a vessel, will cause the fuse to slide quickly forward through its channel, the forward end I of its case shearing off the pin *m* and then passing unobstructed into the center of the shell. The cap *o* is exploded when the fuse-head brings up against the fixed striker *p* in the forward portion of the shell, the cap *o* setting off the fuse material and this material exploding or detonating the explosive arranged in the racks or arranged in any other form in the shell-cavity.

Other crushable material besides untempered metal may be used to take up the rearward play of the fuse.

The central idea is to produce a safe shell and place the fuse at a harmless distance at all times except when it is intended the shell shall explode at, on, or in the target. This is accomplished by using the many-compartment racks and putting the fuse in the rear extension, where if from any cause it exploded prematurely it would do no damage, as the fuse would not contain explosive material enough and would be too remote from the explosive in the shell to explode or detonate the latter explosive, it being the intention to use a fuse that must be in actual contact with the explosive in the shell-chamber to explode or detonate it.

Fig. 4 illustrates the fuse intended to detonate wet guncotton, and it is composed of disks *r r r*, of dry guncotton, four notches cut into the outer edge of each, and flat buttons *r′ r′ r′*, of metal or some other suitable material slightly larger in diameter than the circle of notched portion of the disks, are placed between each disk, and four strips *s* of metal or hard wood or other material, with teeth or recesses on the inner side, are placed lengthwise of a column of disks and buttons alternately placed, the teeth grasping the buttons and preventing the motion, and the strips *s* fitting in the notches so as to form a round bar, and the end secured by any desired means. I show nuts or heads *t*, slightly larger in diameter than the body of the fuse, screwed on. This would keep the disks just off the sides of the fuse-channel and prevent explosion from friction, and the teeth on the strips hold each button in its place and each disk of guncotton is insured from being crushed when fired.

I have shown a cartridge-case *u* of the usual order with several primers or caps *o* in the head and held in the fuse by ring *v*, screwed into position. The forward end of fuse may have a knife-edge, and as dotted lines indicate the firing-striker *p* may be carried by the fuse, and any length of striker may be used, as is shown in dotted lines of striker Fig. 1. In case *u* may be gunpowder, fulminate of mercury, or any other detonator. A channel is shown through center of fuse in Fig. 4 and a primer or detonator may extend the full length of this channel, as indicated by dotted lines in said Fig. 4, only a portion of the rod or primer being illustrated. Fig. 5, on the line *y y*, shows disks and holding-strips on a line *x x* of Fig. 4.

The case *u*, containing the primer or fulminate with cap *o*, may be attached to or put in place of striker *p* in the head of the shell-chamber, dotted lines, Fig. 8, and there be free and remote from the detonator, giving additional security against premature explosion or detonation. In said Fig. 8, *p′* indicates

where the striker would be if the primer were not used.

A cover K, of non-conductor-of-heat material, may be placed over or in the rear extension or fuse portion of the shell. A box or tank L, filled with water, oil, or other cooling or lubricating material, may envelop or be placed against the rear portion of the shell, as shown in dotted lines, Fig. 1. The box or tank would be ruptured, crushed, or squeezed when the shell is fired and the contents of tank forced rapidly through numerous slits or holes *w w* in the outer rim or base of the shell or in its rotating band, Figs. 1 and 8, and cool and lubricate the bore of the gun, afford a cushion, and lessen friction and reduce pressure. The upper portion of tank L may carry the sabot or rotating band, double dotted lines, Fig. 1.

Various means can be used to cause a lubricating material to spread itself when the gun is fired over the walls of the barrel in advance of the travel of the friction-producing portion of the projectile.

The rear extension of the shell may carry the sabot or rotating band, Fig. 8, dotted lines.

In Fig. 7 the rear extension of the projectile is charged with an explosive, which may be a fluid, that on impact of the shell will break or displace the glass or other partition M, (also shown in Fig. 1,) and the fluid being of such a character that it will mix with and explode or detonate the explosive in the forward compartment of the shell. The idea is the same as previously described and illustrated—viz., to separate the explosive and its detonator and the detonator and its primer when necessary by placing one in the shell and the other in the rear extension of the shell, remote from the bursting charge in the shell.

In some cases a fluid may be used in the fuse-channel and secured by glass or other material, as a partition M, dotted lines, Fig. 1.

A sliding or telescopic fuse may be put in nose-piece, dotted lines, Fig. 8, of shell.

A gas-check N on rear extension, Fig. 1, is used when fired from double-charge guns or cartridges.

It is understood that the various shells in use may be arranged as heretofore described, using any desired material in construction and making use of any of the well-known primers, detonators, and high explosives.

Many modifications may be made, as is apparent, without departing from the letter, scope, and intent of my invention.

I am aware that it has been proposed to construct a shell with a hole in its front end, in which hole is to be placed a fuse-carrier which, when the shell strikes, throws the material of the fuse after percussion backward into the main charge. In such proposed device the tube or holder has its inner end made smaller, so as to form a guide for the insertion of the tube. There is no strengthening or reinforcement of the tube, because none is needed.

The prime object of my invention, which is applied to the rear of the shell, is to make such provision as in case of premature explosion of the detonator the detonator-carrier will be separated from the shell without exploding the main charge.

I claim—

1. The combination with a fuse charge, of a tube therefor, which is strengthened or reinforced, and left relatively weaker at its rear end, substantially as set forth.

2. A fuse-tube adapted to carry a fuse charge in its rear end and reinforced in advance of the normal position of said fuse charge, substantially as set forth.

3. The combination with a shell, of a fuse-tube within the same, and a reinforcement in advance of the rear end of said tube and between the same and the body of the shell, substantially as set forth.

4. A fuse-tube for shells provided in advance of its rear end with a closing-base for the shell adapted to reinforce said tube, substantially as set forth.

5. The combination with a shell, and a fuse-tube within the same, of a fuse charge in said tube and adapted to move longitudinally within the same, and a follower or tamping device at the rear of said charge and adapted to move forward with the same, substantially as set forth.

6. The combination with a shell having a space or chamber for an explosive charge, of a fuse-tube, the tube portion of which extends from without the charge-chamber and shell and thence forward into the charge-chamber, and a fuse charge in said tube normally situated in that portion of the tube exterior of said charge-chamber and movable from said position to the inner or forward portion of the tube, as set forth.

7. In a shell having a chamber for an explosive charge or the like, a guide extending forward into said chamber, and a plunger-body composed entirely of detonative material free to move longitudinally rearwardly in the guide by the inertia of the material to prevent immediate detonation and that of the explosive charge upon the striking of the shell, as set forth.

8. In a shell, a closed tube extending from its base toward its end, a holder of thin material to contain a plunger-body composed of detonative material mounted in said tube and free to move longitudinally in the tube by the inertia of the material to prevent immediate detonation and rupture of the tube upon the striking of the shell, and a shear-pin normally holding the holder against forward longitudinal movement, as set forth.

9. In a hollow shell, a guide-tube extending longitudinally through the chamber of the shell, a holder for a mass of detonative material supported loosely at the rear of the tube and independent of the rotation of the shell and movable in the tube by the inertia of the material to prevent immediate detonation,

and means at the forward end of the tube to detonate the material, as set forth.

10. A high-explosive projectile, said explosive carried in a series of separate and independent subdivided intercommunicating compartment-racks, substantially as described.

11. A high-explosive projectile, said explosive carried in a series of separate and independent subdivided racks and a fuse to detonate said explosive, substantially as described.

12. A high-explosive projectile charged with separate and independent subdivided explosive-holding racks resting on cushions, substantially as described.

13. A high-explosive projectile charged with separate and independent subdivided racks carrying the explosive and surrounded by the shell-liner, substantially as described.

14. A shell having a longitudinal channel through its charge, a fuse in said channel and at the rear thereof, a non-elastic coiled wire or cushion, and a striker or primer forward of said fuse, substantially as described.

15. A projectile for high explosives provided with a fuse or detonator, said detonator composed of a series of disks held in place against motion, substantially as described.

16. A projectile for high explosives provided with a fuse or detonator, said detonator composed of a series of dry guncotton wafers or disks held in place against motion, substantially as described.

17. A shell provided with a subcaliber rear extension; a lubricant-casing surrounding such extension; and a channel extending from the inside of the casing to the outside of the shell, as set forth.

18. A projectile having a rear extension-body thereon, said extension carrying the fuse, or detonator, for the charge which is forward in the projectile, substantially as described.

19. A projectile having a rear extension-body thereon, said extension having therein a longitudinal channel in which is carried a detonator or fuse, substantially as described.

20. A high-explosive projectile having a rear extension-body thereon, said extension-body carrying the fuse or detonator for the explosive which is forward thereof, and means to separate detonator and explosive until fired, substantially as described.

21. A projectile having a longitudinal fused channel, a removable plug closing said channel, and a fuse and a fuse-stop therein, substantially as described.

22. In combination with the body of a shell a series of subdivided explosive-holding racks and buffers or cushions interposed between and surrounding the same, substantially as described.

23. A high-explosive projectile charged with separate and independent high-explosive subdivided racks, surrounded by a cushion or lining, substantially as described.

24. A high-explosive projectile having its charge-carrier composed of a series of superposed subdivided intercommunicating racks, substantially as described.

25. A high-explosive projectile having its charge-carrier composed of a series of separate and independent superposed racks centrally apertured to form a fuseway, substantially as described.

26. A high-explosive shell in combination with the charged section longitudinally apertured for a sliding fuse, a rearward extension correspondingly apertured, and a frangible partition separating the sections of the fuseway, substantially as described.

27. A charge-rack for high-explosive projectile consisting of a disk having upon its face a series of open cells communicating with each other, substantially as described.

28. A charge-rack for high-explosive projectile consisting of a disk having a series of flanges projecting from its face and forming cells and a central passage said flanges apertured to afford communication to and between the cells, substantially as described.

29. A high-explosive projectile having its charge-carrier centrally supported therein permitting rotation of the carrier within said projectile when fired, substantially as described.

30. A high-explosive projectile having its detonator and primer remote from each other until fired, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HARRIS P. HURST.

Witnesses:
F. L. OURAND,
J. GREGORY.