(No Model.)

J. W. GRAYDON.

HIGH EXPLOSIVE SHELL.

No. 382,224. Patented May 1, 1888.

Fig. 1.

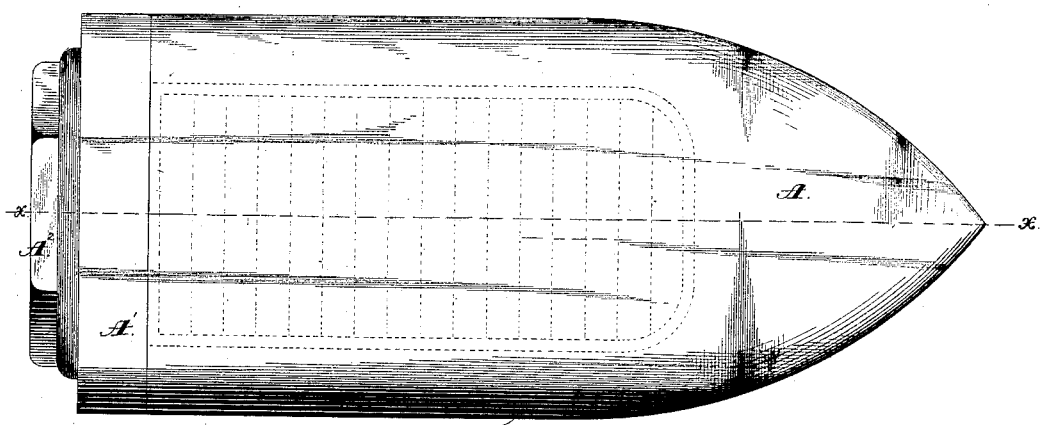

Fig. 2.

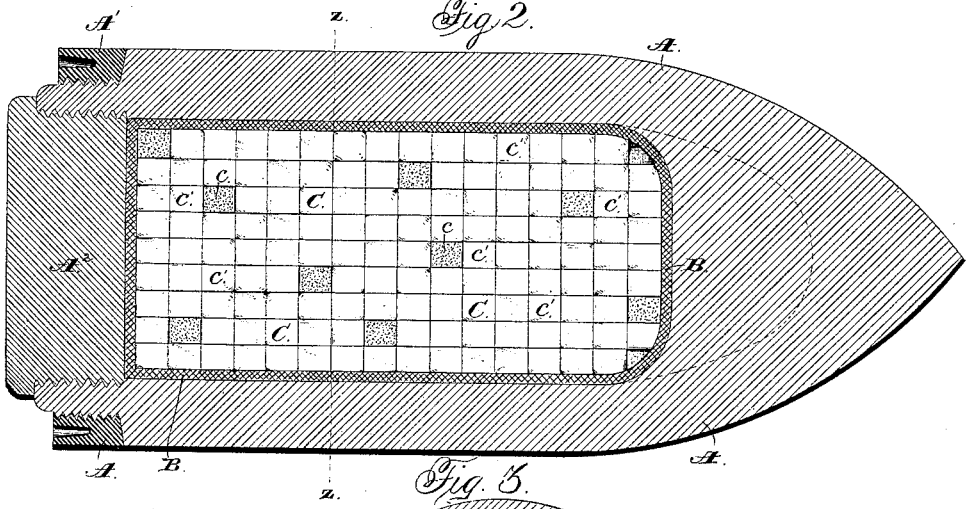

Fig. 3.

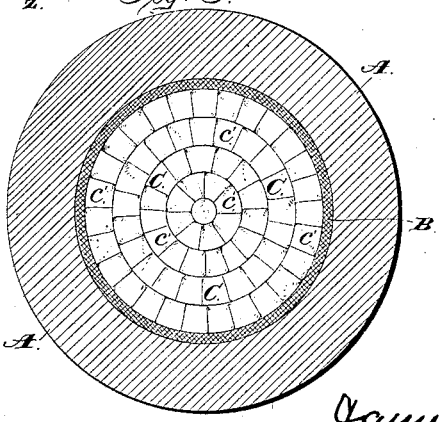

Fig. 4.

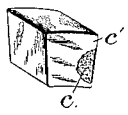

Fig. 5.

Witnesses:
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Inventor.
James W. Graydon
by Pinckle and Russell
his attorneys.

UNITED STATES PATENT OFFICE.

JAMES W. GRAYDON, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE GRAYDON DYNAMITE PROJECTILE CARTRIDGE AND HIGH EXPLOSIVE COMPANY, OF SAME PLACE.

HIGH-EXPLOSIVE SHELL.

SPECIFICATION forming part of Letters Patent No. 382,224, dated May 1, 1888.

Application filed February 15, 1888. Serial No. 264,063. (No model.)

To all whom it may concern:

Be it known that I, JAMES W. GRAYDON, of Washington city, in the District of Columbia, have invented certain new and useful Improvements in High-Explosive Shells; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which—

Figure 1 shows a view in elevation of a shell loaded in accordance with my invention; Fig. 2, a longitudinal section of the same on line *x x* of Fig. 1, with some of the pellets or packages shown in section; Fig. 3, a transverse section of the shell on line *z z* of Fig. 2; Fig. 4, a detail perspective view of one of the pellets with which the shell is shown as loaded, a portion of the pellet-envelope being broken away, and Fig. 5 a similar view of a modified form of pellet.

Letters of like name and kind refer to like parts in each of the figures.

The object of my invention is to provide certain improvements in explosive shells; and to this end my invention consists in the shell loaded, as hereinafter specified, in the construction, arrangement, and combination of the parts of such loaded shell, and the charge with which the shell is loaded, substantially as and for the purpose hereinafter specified.

As is well known to those familiar with the handling of dynamite and analogous high explosives containing nitro-glycerine or other sensitive explosive agent, liquid or semi-liquid in form, if a mass of such high explosive be exposed to shock or pressure, the nitro-glycerine or other sensitive explosive agent will concentrate out of the absorbent or other material normally holding it. This concentrating or collection of the nitro-glycerine or active constituent part of the explosive used puts the mass of explosive into a highly and dangerously sensitive state. When a mass of dynamite is submitted to pressure and shock, as where a shell loaded with an undivided body of it is fired from a gun, the nitro-glycerine is pressed or concentrated out of the absorbent, and, on account of its sensitiveness to friction or shock and heat, is exploded before the shell can leave the gun.

In my application, No. 237,448, for United States Patent, now pending, I have set forth a way of and means for preventing this dangerous concentration or collection of the nitro-glycerine from the dynamite when the latter is exposed to shock, even such as it would get from being fired in a shell from a gun. In such application the mass of dynamite making up the explosive charge of the shell is set forth as being divided up into small portions, each of which is made up into a pellet inclosed by a flexible envelope.

When the envelope is flexible and thin, as of paper or cloth, it is, as described in said application, best coated with paraffine to prevent any saturation of the envelope with nitro-glycerine or any oozing of the latter through such envelope.

To prevent any heat reaching the explosive charge from without the shell, I also show and describe in my said application a lining non-conductive of heat surrounding the charge, and interposed between it and the walls of the shell.

In my present application I do not claim or intend to cover by my claims a shell loaded with dynamite or high explosive divided up into small portions, with each portion surrounded by a flexible envelope, the non-conductive envelope surrounding the charge or any of the features shown, described, and claimed in my other application, hereinbefore referred to.

In the drawings of the present case, A designates the casing of the shell, which can be of any desired form or material. As shown, such shell is of the form and construction used for an armor-piercing shell for muzzle-loading rifles. It is of the ordinary form and construction of shells for such rifles, having the gas-ring A′ of the well-known construction and operation, and the breech-plug A^2 for closing the rear end of the chamber.

Where the shell is to be used for armor piercing and breaking, a solid point is left, as shown in full lines in Fig. 2; but where the shell is merely wanted for carrying an explosive charge, and not for piercing armor, the charge cavity or chamber can be extended farther forward, as indicated in dotted lines in said figure. The form and construction of

the shell, however, has nothing to do with my invention.

Any of the well-known kinds or forms of shells having an opening to allow the inside of the shell-chamber to be got at can be used without involving any departure from my invention.

The shell can be made much longer in comparison to its diameter than the one shown in the drawings, and be, as is usual with such elongated shells as now made, provided with suitable gas and supporting rings to take the gun-rifling and center the shell.

Within the charge-chamber of the shell, which is preferably to be made with smooth walls, is the charge-inclosing casing or lining B, of material non-conductive of heat. The smoothing of the walls of the charge-chamber is not necessary, but it is desirable to have them smooth enough so as not to cut or tear the lining when the shell is first started into rapid rotation. Within this lining or non-conducting casing B is the charge of explosive, C. As shown, such charge is not in one mass or lump of explosive, but is subdivided into a number of small portions, *c c*, each inclosed in an envelope, *c'*, so as to make a pellet or small package. The charge, then, consists of a number of small pellets of the high explosive packed together within the non-conducting lining.

As will be seen, the idea of separating the mass of explosive into small portions inclosed in envelopes is the same one which is carried out in the shell shown and described in my said other application; but instead of making the envelopes of flexible material, as set forth in such application, I make them, in accordance with my invention, covered in this present case, of inflexible material adapted to withstand the shock of the starting of the shell by the propelling-charge, so as to keep the contents of the several pellets separate, but capable of being shattered by an explosive fuse or other means when explosion of the shell contents is desired.

For the envelopes of the pellets I prefer to use some material non-conductive of heat—as, for instance, some compound of asbestus or wood—but do not limit myself to such materials. Paper-pulp, papier-maché, pasteboard, straw-board, or the pulp from which straw-board is made, may be used. I contemplate also, where desired, using thin metal envelopes, but I prefer the materials set forth above. The pellets are shown as packed in layers within the inclosing-lining B in the shell-chamber.

Where space is to be economized, the pellets are preferably made of the shape shown in Fig. 4, so that they can be packed in concentric rings forming together one disk-like layer of a diameter just equal to that of the space within the lining B. The pellets are not then quite square in cross section, but have their sides inclined slightly inward toward each other, but their tops and bottoms substantially parallel.

If desired, the pellets can be made cubical in shape and packed in concentric rings, like the pellets already described, or, as shown in Fig. 5, they can be in the shape of short cylinders.

For convenience and dispatch in loading the shells, as desired, I intend to put up the charge of pellets in the form of a cartridge to fit the shell-chamber. With this end in view the casing or shell-lining B is made separate from the shell, and is packed full of the pellets before being put into the shell. For this purpose the casing or lining B can be made of the asbestus or other material formed into a cylinder or tube to fit the shell-chamber.

The sides and forward end can be made of one piece, and the other end can be fastened or attached in place in any suitable way after the pellets have been packed therein.

With the shell-charges thus put up in an inclosing envelope or casing the shells can be kept unloaded until wanted for use, and then can be most quickly and expeditiously loaded by the insertion of the prepared cartridges. Said cartridges as made up can be stored or transported with entire safety, as the nitro-glycerine or other high explosive agent cannot concentrate or collect, so as to put the cartridges in a dangerous state. Neither shock, pressure, or long standing as stored, can cause concentration of the nitro-glycerine from dynamite put up in accordance with my invention.

With the dynamite or other high explosive inclosed in a non-conductor, as described, the shell-cartridges are also protected from the danger of heat.

With the stiff, rigid, or inflexible coverings for the pellets, none of the pellet contents are subjected to the weight of the other pellets.

Where the shell is a long one and the mass of pellets within of considerable weight, I contemplate having, as shown in my pending application for United States Patent No. 242,520, and as indicated by dotted lines in Fig. 2 of the present application, one or more plates or partitions dividing the charge of pellets up into several portions, such partitions being supported in any desired way against rearward movement in the shell.

In my shell, as shown and described in my present application, I have shown no fuse, as any of the well-known forms thereof can be used. Whatever kind of fuse is employed, however, it should have a sufficient quantity of explosive to shatter the envelopes of the pellets in the shell-charge, so as to explode the whole charge.

Where the pellet-envelopes are made of asbestus or other material non-conductive of heat, the charge-inclosing envelope is not necessary to keep the heat from the explosive, but I prefer to use such envelope around the whole charge. Where the explosive charge is divided up into small portions, with each portion inclosed in a separate envelope so as to form a distinct pellet, all the pellets of one layer can be connected or fastened together. An obvious modification of such arrangement would be to make a layer or sheet of cellular

construction, of paper or other material, and then, after filling the cells with explosive, to close them up in any desired way, so as to keep the contents of the different cells separate from each other. The filled cells can then be placed in the shell either in transverse disk-like layers or in concentric cylindrical layers. I regard such arrangement as being entirely within the scope of my invention, as covered by my claims in the present case. No other figures than those already in the drawings are needed to show the modification just described, as the appearance of the layers of cells would be substantially the same as that of the layers of pellets shown in Figs. 2 and 3. The sheet of explosive-filled shells such as just described can, if desired, be rolled up in spiral form, so as to make a package adapted to just fit the cell-chamber without departure from my invention.

It will be seen from the drawings and description of my invention that the bursting-charge is divided up into small portions in all directions. Not only is the length of the charge divided up, but the parts of the charge between the central line of the shell and the sides thereof are also divided into several small portions.

Having thus described my invention, what I claim is—

1. In a shell, the bursting-charge consisting of a mass of high explosive, which, both radially and longitudinally, is divided up into small portions, with each portion normally held entirely separate from the others, substantially as and for the purpose specified.

2. In a shell, the bursting-charge within the shell-casing, both radially and longitudinally divided up into a number of pellets, each consisting of dynamite inclosed in an inflexible envelope, substantially as and for the purpose shown.

3. In a shell, the shell-bursting charge divided up in all directions into small portions normally held separate from each other and arranged within the shell in a layer or layers, each layer containing several of the separate small portions of explosive, substantially as described.

4. In a shell, in combination with the shell-casing, the bursting-charge therein, which, both radially and longitudinally, is divided up in all directions into explosive pellets, each consisting of a small portion of high explosive inclosed in an envelope non-conductive of heat, substantially as and for the purpose described.

In testimony that I claim the foregoing I have hereunto set my hand this 9th day of February, A. D. 1888.

JAMES W. GRAYDON.

Witnesses:
J. C. PRATT,
A. S. PRATT.