

UNITED STATES PATENT OFFICE.

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CARTRIDGE AND CARTRIDGE-CHARGE.

SPECIFICATION forming part of Letters Patent No. 540,327, dated June 4, 1895.

Application filed January 31, 1894. Serial No. 498,616. (No model.)

To all whom it may concern:

Be it known that I, HUDSON MAXIM, a citizen of the United States, residing at the city, county, and State of New York, have invented certain new and useful Improvements in Cartridges and Charges Thereof, of which the following is a specification.

This invention relates generally to cartridges for small arms or rapid fire guns, and more particularly to the powder or explosive charge for such cartridges; it being understood, however, that the charge may be manufactured and made an article of commerce independent of the cartridges and ready to be combined therewith or for other useful purposes.

This improvement contemplates the use of a powder charge of an impervious nature—that is to say, impervious to the gases of combustion as distinguished from charges which are granular in structure though in compressed or cake form—such impervious powder being, for instance, of the character described in my Letters Patent No. 411,127, dated September 17, 1889, which consists of an impervious colloid of pyroxylin made by means of a volatile solvent of the pyroxylin with or without an admixture of nitro-glycerine, constituting an amorphous solid or mass which, while in a plastic condition, is capable of being shaped, molded or pressed to any desired form.

In carrying out my invention this impervious powder charge is formed preferably in long cylindrical rods having a plurality of longitudinal perforations extending from end to end of the rod, which rod of the required diameter may be cut into lengths adapted to the cartridge shells or cases to be charged; or such rods may be made or molded in the first instance of the proper length for the shells. Such an explosive charge, when combined with the shell, may be ignited at the end by any suitable means, such as a fulminate cap and an igniting disk in the base of the shell. This disk is preferably made of the fulminating compound set forth in my pending application, Serial No. 486,978, filed October 2, 1893, consisting of an agglutinated mass of a fulminate and an explosive base. The firing of this disk communicates a flame to and throughout the said longitudinal perforations

of the explosive charge and the combustion of the latter will begin on the interior walls or surfaces of the perforations, and, on account of the impervious character of the charge as already mentioned, proceeding radially outward from each perforation in what may be termed a gradual manner no faster than the combustion and consumption of the surfaces presented to the flame uncovers succeeding portions of the charge. It is, however, desirable for certain purposes to prevent or retard during the first period of the explosion the combustion of the rear surface or portion of the explosive, and for this purpose I provide means for closing the rear ends of the majority of the longitudinal perforations so that the flame of the fulminate is not communicated directly to said majority of the perforations but passes to the front end of the explosive through one or more of the perforations, for instance, through a central perforation which may be of somewhat greater diameter than the others, left open for the purpose, and thence back through the remaining perforations. In order, however, to somewhat limit the initial pressure of the gases so that there may be a continuous increase of such pressure up to the time when the projectile leaves the muzzle, as distinguished from a high initial pressure subsequently relieved by the movement of the ball, I further retard the ignition of the interior walls of a majority of the longitudinal perforations by temporarily occluding their front ends, as by a wafer or disk of explosive substance which must be consumed before the flame from the said central perforation can pass back through all of the other perforations and ignite all of the interior walls of the charge as aforesaid.

Many fire arms being adapted for shells the diameter of the body of which is greater than that of the neck through which the explosive is introduced, my improved solid charge when so introduced into the shells for such arms will form an annular chamber between itself and the cartridge shell. In order, therefore, to obviate the chance of disruption of the powder charge by unresisted internal pressure, I provide means for the passage into said annular chamber of a portion of the gases first generated, thereby balancing by their external pressure that from the interior

of the charge. Such means may consist of transverse grooves in the front end of the charge. The flame thus admitted with the gases to the exterior of the charge would, if the latter were left unprotected, immediately 5 ignite such an extensive surface as to generate too great an initial gas pressure, which might not be kept up and increased as desired to give the greatest muzzle velocity and prevent the damping and extinguishment of the powder charge. I, therefore, provide for the latter an envelope of thin metal, such as brass, which accomplishes the above mentioned purpose and also affords an efficient protection for 10 the charge when not combined with the shell, and in such latter form the charge may be made an article of commerce and military supply, and may be used in cannon without an external cartridge shell.

Such being in general the leading features of my invention, I have, in order to make the same more clearly understood, shown in the accompanying drawings means for carrying it into practical effect, without limiting the 25 improvements in their useful applications to the particular construction which, for the sake of illustration, I have delineated.

In said drawings, Figure 1 is a longitudinal sectional view of a cartridge embodying my 30 invention. Fig. 2 is a perspective view of the powder-charge and inclosing envelope. Fig. 3 is a transverse sectional view on line III III, Fig. 1.

Referring to the drawings, the improvement 35 is illustrated with a cartridge shell or case A of a well known form, having a body portion a which, near its forward end, contracts to a neck b that is arranged to receive a ball or projectile B and wad o ; while the rear end 40 of the shell has a closed head c providing a seat for a suitable fulminate cap d as is common.

The powder charge C is preferably prepared in the form of a cylindrical or prismatic rod 45 of a diameter that will permit the rod to be readily loaded into the shell through the open end of the neck b and of a length suited to extend from the head c of the shell to its contracted or neck portion b , such neck affording 50 a support for the charge to hold it in a central position with respect to the larger diameter or body portion a of the shell and thus form the surrounding annular chamber e . The charge C is also formed with a number of 55 longitudinal perforations i extending longitudinally of the mass. The perforations are preferably so disposed throughout the rod as to leave equal masses of the explosive material surrounding each perforation so that the 60 flame of combustion communicated to the explosive along each of the perforations will gradually consume the mass and by the time the perforations have become so much enlarged as to meet, practically the entire mass 65 will have been consumed; and in this manner the area of explosive along each perforation exposed to the flame of combustion has grad-

ually increased so that an accelerating propulsive action upon the projectile is insured.

In order to close the rear ends of the perforations I provide a piece C' consisting preferably of the same material as the body of the charge, but which is not perforated to correspond with all of the longitudinal perforations of said main body. This supplemental piece, 70 which is preferably attached to the main body of the charge as by a cement or by the use of a solvent of the explosive material is, however, formed with one or more perforations registering with one or more of the perforations of the charge. I prefer to employ for this purpose a single longitudinal opening c' , of larger diameter than that of the majority of the perforations of the charge, which corresponds with a central longitudinal perforation c^2 in 75 said main body. The supplemental piece C' thus constitutes practically an integral portion of the powder charge, and has, by preference, its rear end somewhat dished or concaved to fit upon and be held from lateral movement by the usual inward projection on the base of the cartridge shell. Such concaved portion is indicated at c^3 and serves also as a seat or recess for the igniting disk or compound d' . The powder charge is further provided 80 at its forward end with a wafer or disk C^2 of explosive substance and which occludes the majority of the perforations of the charge having, however, a central opening to correspond with the perforation c^2 . The wafer may 85 be cemented in place, as described in connection with the piece C' . In the front face of said wafer, or in the rear face of the wad, or in any other suitable manner, transverse grooves or openings f are formed communicating with 90 the annular space e and adapted to give the initially generated gases access to the last mentioned space, thereby counterbalancing the outward pressure and disrupting tendency of the gases generated within the perforation c^2 . This wafer is adapted to be readily consumed 95 by the flame, and, as its combustion takes place, said flame will be admitted to the front ends of the longitudinal perforations of the powder charge.

At r is shown an envelope of metal, such as brass, fitting around the charge C and protecting its exterior from ignition. While such envelope might perhaps be made sufficiently strong to resist the disrupting effect of the interiorly generated gases, and hold the charge together, I prefer to employ a thin sheet of metal, relying upon the counterbalancing effect of the exteriorly conducted gases as above mentioned. To aid in carrying the igniting 100 flash through the perforations of the charge, and in starting the combustion of their interior walls, I may fill such perforations or certain of them with granular powder as indicated at p .

I do not in this application claim a longitudinally multi-perforated powder grain, or such a grain or charge combined with a cartridge shell of greater internal diameter than 130

the grain, such features being in part the subject of my companion application executed of even date herewith, Serial No. 493,658.

I claim—

5 1. A charge for cartridges consisting of an explosive in the form of a rod or solid having a plurality of longitudinal perforations, and a supplemental piece of explosive material at the end of said solid and closing certain of said perforations, substantially as set forth.

15 2. A charge for cartridges consisting of an explosive having a plurality of longitudinal perforations, a supplemental piece of explosive material closing the rear ends of certain of said perforations, and a wafer or disk of explosive material at the forward end of the charge for retarding the access of flame to the perforations, substantially as set forth.

20 3. A charge for cartridges consisting of an explosive having a plurality of longitudinal perforations, a supplemental piece of explosive material closing the rear ends of certain of said perforations, and a wafer or disk of explosive material at the forward end of the charge for retarding the access of the flame to the perforations, and a metallic envelope for the charge, substantially as set forth.

30 4. A cartridge comprising a shell, having the interior of its main body of uniform diameter, and an explosive in the form of a rod or solid of less diameter than the internal diameter of the shell, leaving an annular space and having a metallic envelope, substantially as set forth.

35 5. A cartridge comprising a shell, an explo-

sive consisting of an impervious colloid of pyroxylin in the form of a rod or solid of less diameter than said shell and having a plurality of longitudinal perforations, a supplemental piece of explosive material closing the rear ends of certain of said perforations, a wafer or disk of explosive material closing the forward ends of certain of the perforations, and a metallic envelope around the charge, substantially as set forth.

45 6. A cartridge comprising a shell, an explosive consisting of an impervious colloid of pyroxylin in the form of a rod or solid of less diameter than said shell and having a plurality of longitudinal perforations, a supplemental piece of explosive material closing the rear ends of certain of said perforations, a wafer or disk of explosive material closing the forward ends of certain of the perforations, a metallic envelope around the charge, and granular powder in the perforations, substantially as set forth.

55 7. A charge for cartridges consisting of an explosive in the form of a rod or solid having a plurality of longitudinal perforations, and a wafer or disk of explosive material at the forward end of the charge for retarding the access of the flame to the perforations, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two witnesses.

HUDSON MAXIM.

Witnesses:

E. L. TODD,

H. N. LOW.