J. LUCIANI.

MANUFACTURE OF GUNPOWDER.

APPLICATION FILED OCT. 14, 1904.

952,538. Patented Mar. 22, 1910.

Fig. 1.

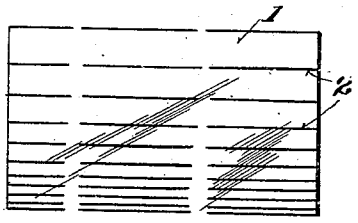


Fig. 2.

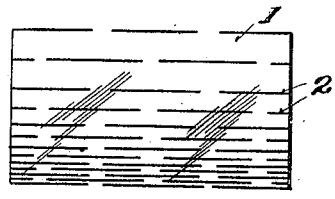


Fig. 3.

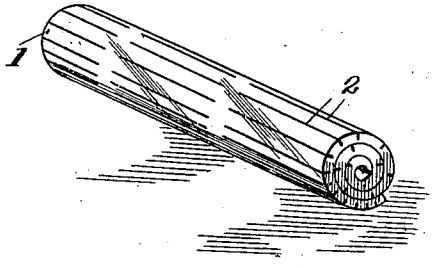
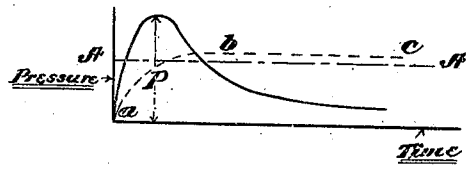


Fig. 4.



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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF GUNPOWDER.

952,538. Specification of Letters Patent. Patented Mar. 22, 1910.

Application filed October 14, 1904. Serial No. 228,456.

To all whom it may concern:

Be it known that I, JACQUES LUCIANI, of 100 Rue d'Amsterdam, in the city of Paris, Republic of France, have invented a new and useful Improvement in the Manufacture of Gunpowder, which improvement is fully set forth in the following specification.

Investigations which have been made with reference to the composition of gunpowder charges for ordnance and small fire-arms of all kinds have led to the discovery that very favorable results may be obtained with a charge composed of a sheet of gunpowder (or of several sheets if necessary) coiled on itself (or themselves) and provided with cuts or incisions of suitable shape and arrangement.

As is well known, a charge of ordinary powder when burned in a close space, like the chamber of a gun, and associated with a movable projectile, results in the generation of a certain maximum pressure which is an important factor to be considered in determining the strength to be given to the gun. Further, erosions in the gun are in part caused by the projection of solid particles, incompletely burned, from the axis of the gun to the periphery thereof, and one way to reduce the erosions to a minimum is to diminish the speed with which the solid particles are projected, inasmuch as the active force of the particles increases as the square of the speed.

The object of the present invention is therefore to provide a charge of gunpowder so constituted as to have a certain maximum pressure lower than that attained with an ordinary charge, but which maximum pressure will be maintained constant until the charge is completely consumed, which occurs a moment before the projectile leaves the mouth of the gun. The use of such a charge permits of the employment of less expensive and lighter ordnance than heretofore, and also results in a diminution of the injurious erosive action. Briefly stated, these desirable results are attained by forming in the surface of a sheet of gunpowder, preferably of the smokeless powder variety, scores or incisions the distance between which progressively and regularly varies, said scores or incisions thus increasing per unit of surface from one edge of the sheet of explosive to the other so that when the sheet is rolled up the surface of the powder, per unit of volume, will decrease progressively and regularly from the axis to the periphery of the roll.

The invention will be better understood by reference to the accompanying drawings, wherein,

Figure 1 illustrates a rectangular sheet of explosive provided with scores or incisions, spaced equi-distant longitudinally but at varying distances transversely; Fig. 2 is another expression of the inventive idea, the scores or incisions overlapping one another longitudinally and arranged at varying distances apart transversely; Fig. 3 is an end view corresponding to Figs. 1 and 2 when rolled up; and Fig. 4 is a diagrammatic view illustrating by comparative pressure curves, the advantages secured with the explosive of the present invention.

Referring to the drawings, 1 represents a sheet of any suitable explosive, preferably gunpowder, and 2 indicates scores or incisions formed therein. It is not necessary that the scores or incisions should extend entirely through the thickness of the sheet, as excellent results have been obtained with the same extending only partly through the thickness thereof, and the depth of said scores or incisions may be either constant or varying, the result sought being attained by progressively and regularly varying the distance between said scores or incisions; in other words, increasing them in number, per unit of surface, from one edge of the sheet to the other, so that when the sheet is rolled up the surface of the powder, per unit of volume, decreases from the axis to the periphery of the roll.

Referring to Fig. 3, it will be observed that the scores or incisions in the outer spirals of the charge are spaced much closer together than those of the innermost spirals, and it is therefore apparent that the outer spirals will be more rapidly consumed than the innermost ones, whereby a sudden disruptive action, which would occur if the innermost spirals burned more rapidly than the outer spirals, is prevented.

The rapid consumption of the outer spirals, due to the presence of the large number of scores or incisions, results in the generation of a pressure which reaches its maximum at the instant the projectile commences to leave the gun, or shortly thereafter, and this rapid consumption has a

tendency to cause said maximum pressure to fall. The innermost spirals are not, however, consumed as rapidly as the outer spirals, by reason of the fact that the scores or incisions are spaced farther apart, but inasmuch as the surface of these scores or incisions exposed to the flame of combustion progressively increases, and accordingly gives off a greater and greater amount of gas, the tendency of the maximum pressure to decrease is thus counteracted, and this maximum pressure is maintained constant until the charge is completely consumed, which occurs an instant before the projectile leaves the gun.

Fig. 4 illustrates diagrammatically the result attained by using an explosive sheet with scores or incisions as herein described as compared with the result secured with an ordinary charge. The vertical line indicates "pressure" and the horizontal line "time." The pressure of the gases when an ordinary charge is burned is represented by the full line, with a maximum pressure P extending high above line A—A—indicating a medium pressure—the pressure, however, rapidly falling off from the maximum to considerably below medium, the curve indicating that the burning of such a charge results in a violent and disruptive explosion. When, on the other hand, a sheet of explosive provided with scores or incisions, arranged as herein described, is employed, the pressure of the gases is fairly represented by the curve in dotted line. It will be observed that from the starting point *a* the pressure gradually rises to point *b*, slightly above the line representing medium pressure, and that from point *b* to point *c*, the pressure is maintained at a constant value slightly above the medium. The burning of a charge such as herein described is gradual and progressive, resulting in the elimination of violent and disruptive discharges, thereby permitting the employment of much lighter and cheaper ordnance; and the reduction of the maximum pressure below that attained with a charge of ordinary powder, by reducing the speed of projection of the solid particles, results in a diminution of the erosive effects in the gun.

What is claimed is:—

An explosive charge composed of a sheet of explosive material having its surface on one side progressively increased in area by a series of parallel scores spaced apart at progressively decreasing distances, said sheet being rolled into a spiral to present the scores nearest together at the periphery of the charge, thereby increasing the peripheral surface of combustion while maintaining combustion constant parallel to the axis of the charge.

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

JACQUES LUCIANI.

Witnesses:
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H. BORTEL,
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