No. 639,227. Patented Dec. 19, 1899.

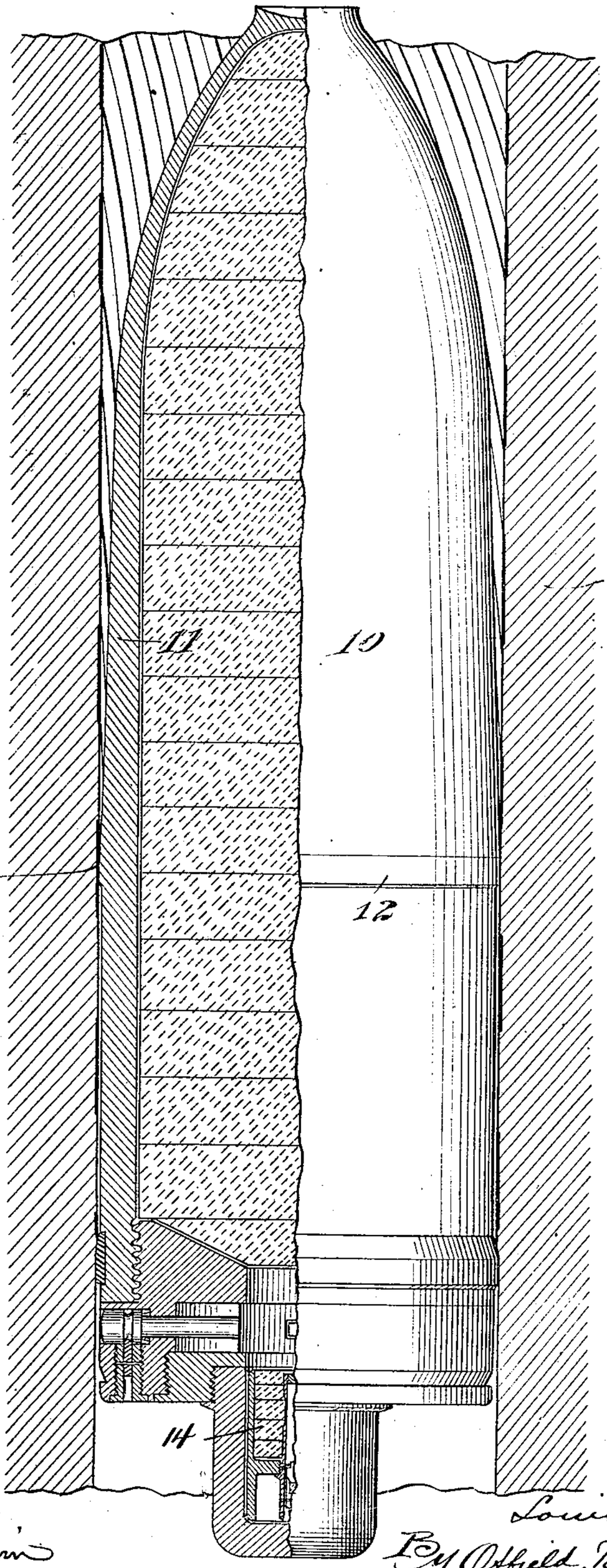
L. GATHMANN.

TORPEDO SHELL FOR HIGH EXPLOSIVES.

(Application filed Nov. 4, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

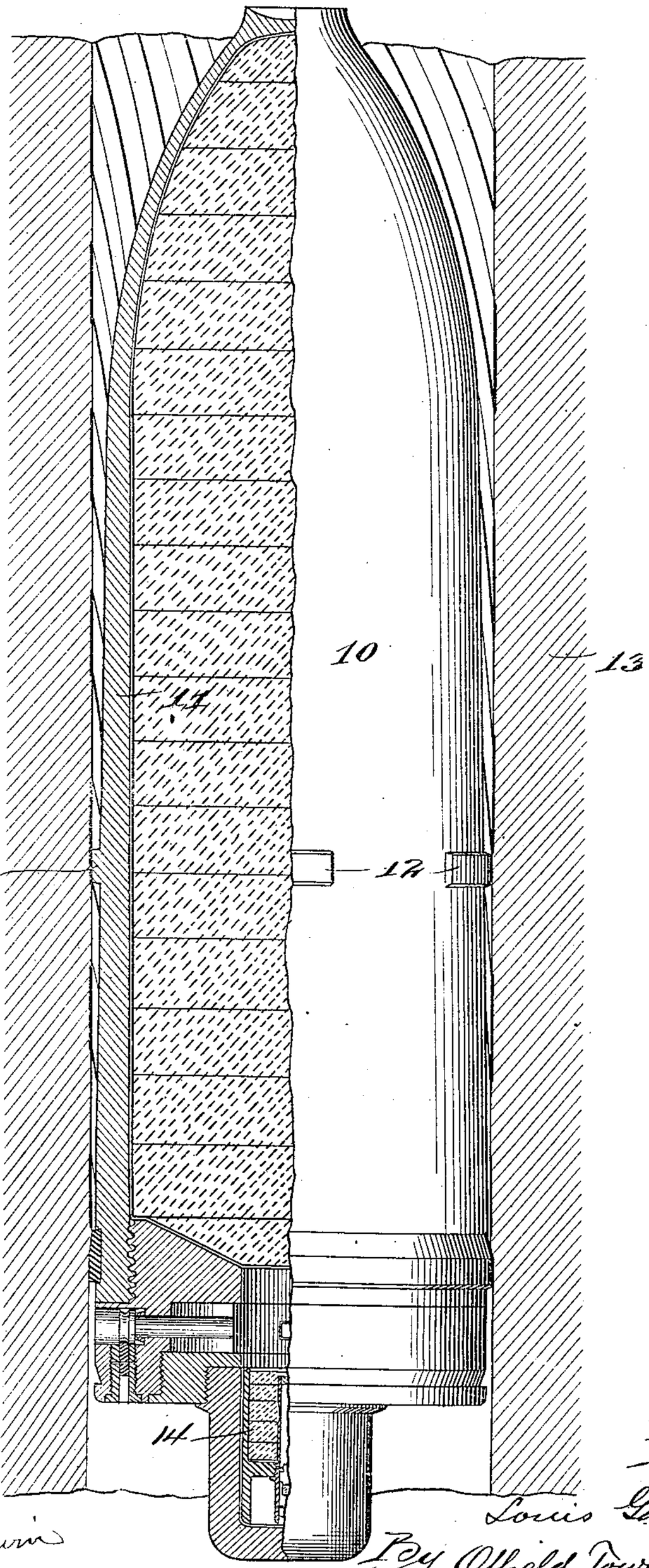

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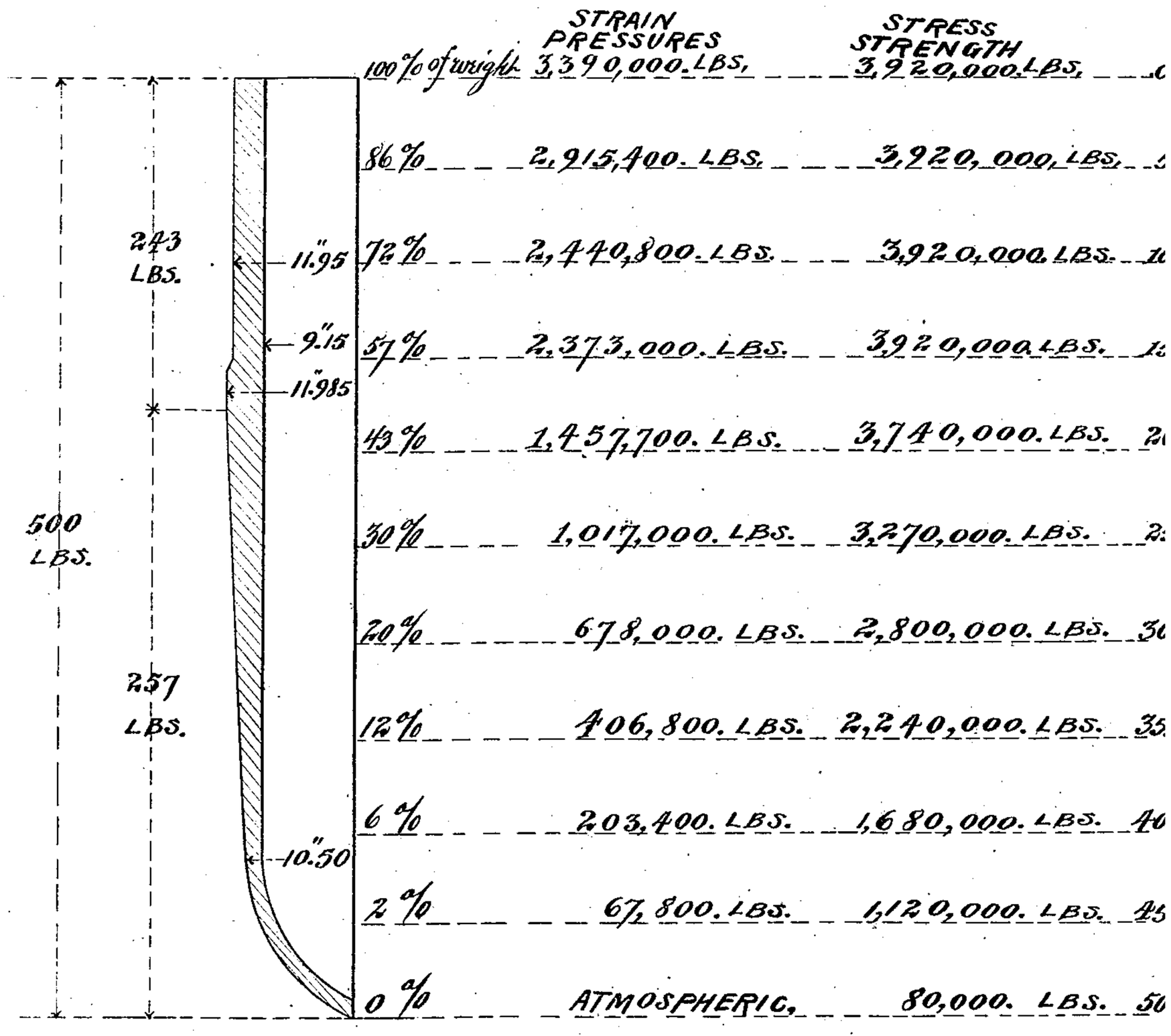
Fig. 3.



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UNITED STATES PATENT OFFICE.

LOUIS GATHMANN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE GATHMANN TORPEDO GUN COMPANY, OF SAME PLACE.

TORPEDO-SHELL FOR HIGH EXPLOSIVES.

SPECIFICATION forming part of Letters Patent No. 639,227, dated December 19, 1899.

Application filed November 4, 1898. Serial No. 695,478. (No model.)

To all whom it may concern:

Be it known that I, LOUIS GATHMANN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Torpedo-Shells for High Explosives, of which the following is a specification.

This invention relates to torpedo-shells for high explosives, and has for its objects, among other things, first, to provide a shell having a maximum capacity for explosives combined with a minimum weight of shell; second, to provide a shell in which the metal shall be so distributed as to insure greater safety from premature rupture or bulging of the shell upon the firing of the expelling charge; third, to provide a shell which shall have superior accuracy of flight; fourth, to provide a shell in which upon impact there shall be a closer proximity to the bursting charge of the object struck, and consequently a maximum efficiency, and, fifth, to provide a shell having these characteristics in which a better or more effective detonation of the bursting charge of the shell may be obtained.

To these ends my invention consists in certain novel features, which I will now proceed to describe and will then particularly point out in the claims.

In the accompanying drawings, Figure 1 is a view showing one form of my invention, the shell being one-half in section and one-half in elevation and illustrated as being in position within a gun, a portion of which is shown in longitudinal section. Fig. 2 is a similar view illustrating a modified form of my invention. Fig. 3 is a longitudinal section through a shell of specific dimensions and containing a legend referring to the size, weight, and strength of said shell.

In the said drawings, 10 indicates the shell as a whole, the body or wall 11 of which is made of gradually-diminishing thickness toward the head or point of the shell. This diminution in the thickness of the body or wall of the shell is obtained by reducing the external diameter of the shell toward the front thereof, as shown in the drawings. The diminution in thickness may exist gradually from the base of the shell to the point, as shown in Fig. 2; but I prefer to give to the body of the shell the form shown in Fig. 1, in which the diminution in thickness of the wall or body thereof is dispensed with as to the rear portion of the shell, the forward portion only being diminished in thickness for about two-thirds of the length of the shell. The bore of the shell is preferably of uniform diameter from the base to or about to the point where the body of the shell contracts to form the point. This affords the maximum cubical capacity in a shell having walls of diminishing thickness without impairing its safety. I shall therefore speak of the base portion of the shell as including the rear end of the shell behind the annular enlargement or "bourlet" and the tapering from base to point as including both forms of construction—*i. e.*, that in which the exterior wall is tapered from the rear end and also that in which the taper begins at the bourlet. In either case there is provided at a suitable distance forward of the base an annular enlargement 12 on the exterior of the body of the shell, which is of a diameter substantially equal to that of the bore of the gun and which serves to steady the shell while in position within the gun, which is indicated at 13.

In the construction shown in Fig. 2, in which the diminution in thickness extends from the base to the point of the shell, the annular enlargement 12 is discontinuous or in the form of lugs, and this construction may be also employed in the case of the shell shown in Fig. 1. The shell is provided at its base or thicker portion with a fuse 14 of any approved construction. By reason of this construction of the body of the shell the weight of said body is diminished relatively to the amount of space provided for the bursting charge, and consequently the proportion of the bursting charge to the total weight of the shell is increased. Moreover, the metal of the shell is so arranged that the relative weight or mass of the metal which resists the forward movement imparted to the base or rear part of the shell when the propelling-gases exert their forces against said base upon the discharge of the gun is decreased, and consequently the strain upon the base and upon that portion of the body of the shell intermediate between the base and the front

end is correspondingly decreased, since there is no heavy mass of metal at the front end of the shell the inertia of which must be overcome by means of a strain upon the base and intermediate part of the shell. By this means greater safety from premature rupture or bulging of the shell within the gun is obtained, owing to the diminution of the strain upon the base and upon the body portion of the shell intermediate between said base and the head or front end of the shell. In addition to these advantages the tapering shape of the shell insures greater accuracy of flight, as the increased rearward diameter of the shell serves to give an increased frictional action of the atmosphere upon the rear part of the shell, thereby tending to preserve the alinement of its flight. A further advantage arising from the described construction lies in the fact that upon impact the explosive charge of the shell is closer to the object struck by reason of the thinness of the metal at the front end of the shell, and a maximum effect of the explosive upon the object struck—such, for instance, as armor-plate—is thereby obtained. This increased effect is also aided by the fact that the shell is made of tough steel and upon impact will be flattened out, so as to bring a larger portion of the explosive close to the object struck by reason of the enlargement of the area of the shell in contact with said object and the bringing of the entire charge closer to the object. Again, the location of the fuse at the rearward portion of the shell, where its body is thickest, serves to produce a better or more effectual detonation of the charge, and consequently a more effective explosion.

In Fig. 3 I have shown a longitudinal section of a shell of specific dimensions—*i. e.*, fifty inches in length and nominally of twelve-inch diameter, but in reality with an extreme external diameter of 11.985 inches. The weight of such a shell is five hundred pounds, and said weight is distributed so as to include two hundred and forty-three pounds thereof from the rear end to a point immediately in front of the bourlet, with the remaining two hundred and fifty-seven pounds in front of said point, as indicated by the dotted lines, tipped with arrows and marked with said numbers. The legend is explained as follows: Assuming one hundred percentum as the total weight of the shell, the table is marked from one hundred percentum at the base to zero at the point. Assuming that the tip of the point has an area of one inch and that the powder charge is placed at the base of the shell, the shell is required to withstand at the point atmospheric pressure only, while the base must withstand a powder-pressure of, say, thirty thousand pounds to the square inch or a total of three million three hundred and ninety thousand pounds. While the stress strength of the base must be adequate to withstand such pressure, the stress strength of the body may be diminished theoretically to fifteen pounds to the square inch at the point. Practically, however, the "stress strength" is in excess of theoretical requirements. Thus in the shell shown the stress strength exceeds the strain pressure by five hundred and thirty thousand pounds at the base and nearly eighty thousand pounds at the point. Fig. 3 also shows the relative thickness of the walls of the shell in its different parts and the rate of taper or thinning of its wall. The external diameter of the shell is greatest at the annular enlargement or bourlet and diminishes gradually from the bourlet to a point distant from the rear end of the shell about four-fifths or more of its length and then contracts rapidly in the remaining fifth from an external diameter of 10.5 inches to the point of the shell. The interior wall of the shell is straight from the rear end thereof for about four-fifths of the length of the shell, the internal diameter of the shell up to this point being about 9.15 inches.

It is obvious that various modifications of the structure shown may be made without departing from the principle of my invention, and I therefore do not wish to be understood as limiting myself to the precise details of construction hereinbefore described and shown in the drawings.

I claim—

1. A shell for firing high explosives, having its metal walls at the forward end comparatively thin, with a gradual increase in thickness from such end toward the base portion and throughout the greater part of the length of the shell, said increase being sufficient to enable them to withstand the increasing strain upon the metal consequent to the shock of firing and upon the increasing weight lying forward of the successively rearward points, substantially as described.

2. A shell for high explosives, having its wall tapering gradually externally from its base, or base portion, toward its front end, and its bore of substantially uniform diameter from the base to the point where contraction toward the front end begins, such external taper and uniform bore extending throughout the greater portion of the length of the shell, substantially as described.

LOUIS GATHMANN.

Witnesses:

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LOUIS T. MANN.