P. L. E. DEL FUNGO-GIERA.

DELAY ACTION DETONATOR.

APPLICATION FILED JAN. 30, 1918.

1,298,466.

Patented Mar. 25, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

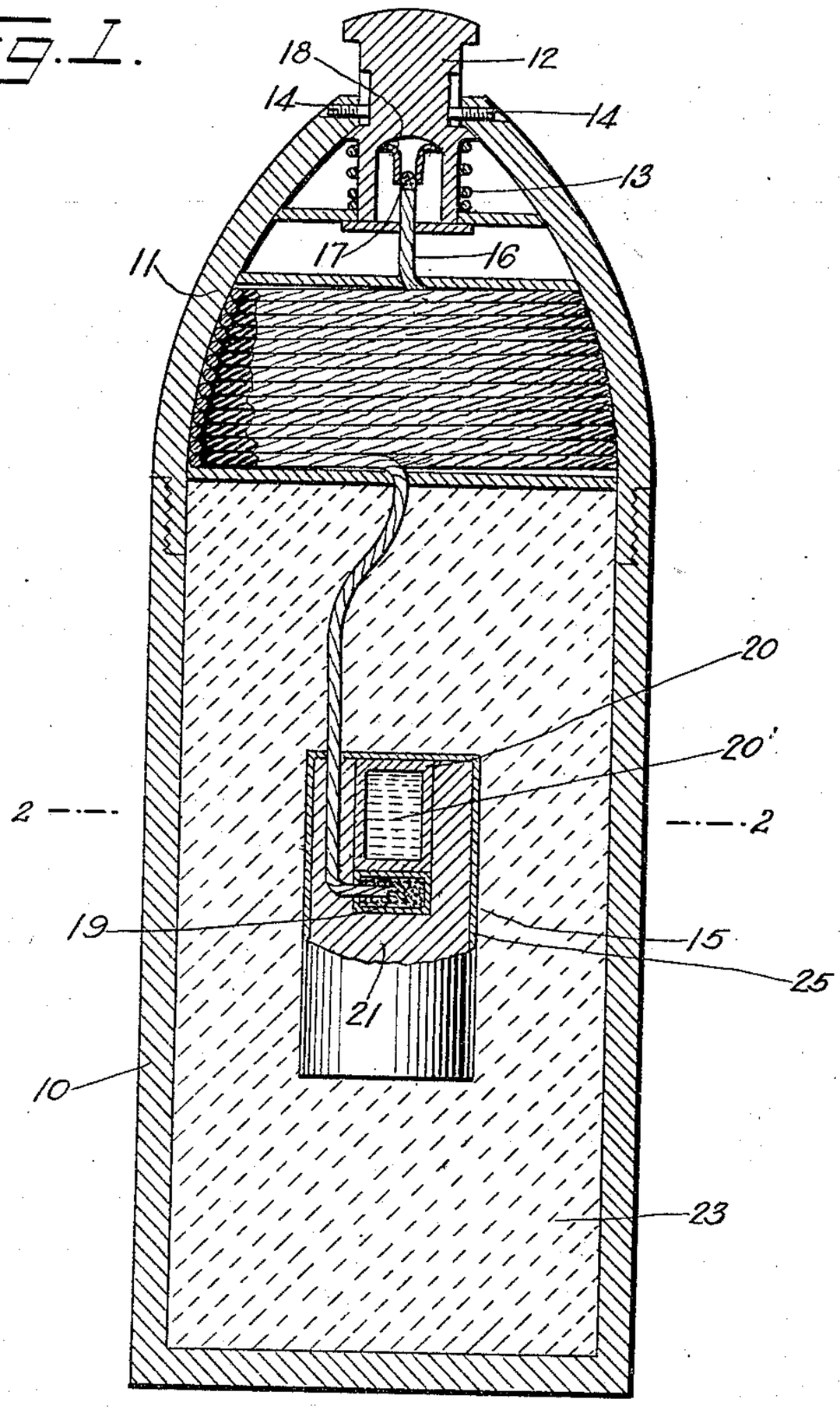
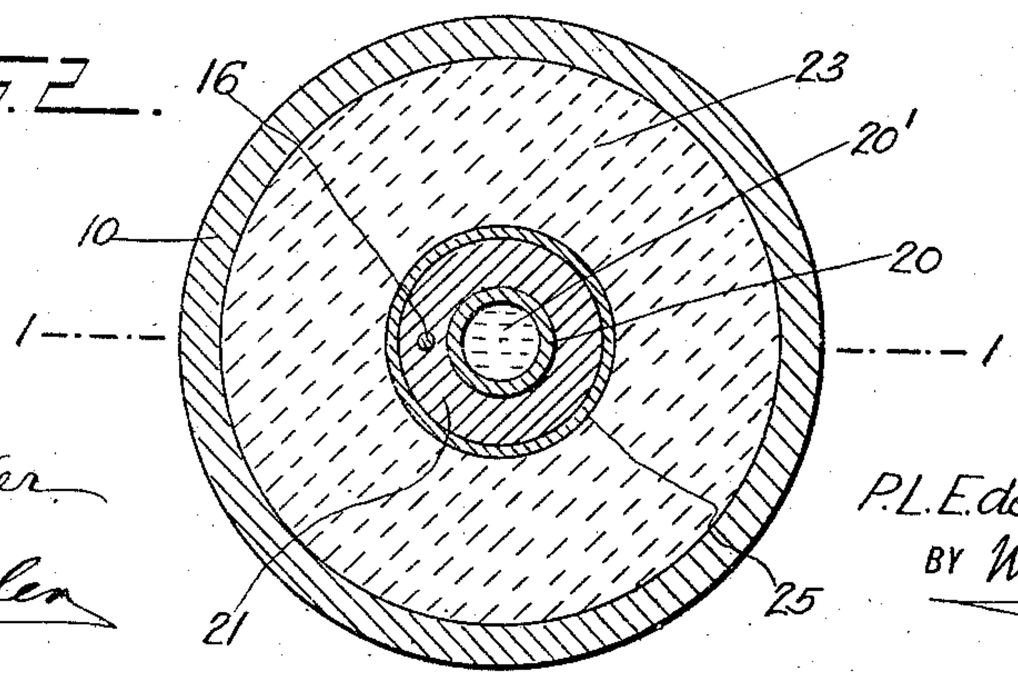


Fig. 2.



WITNESSES

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2 SHEETS—SHEET 2.

Fig. 3.

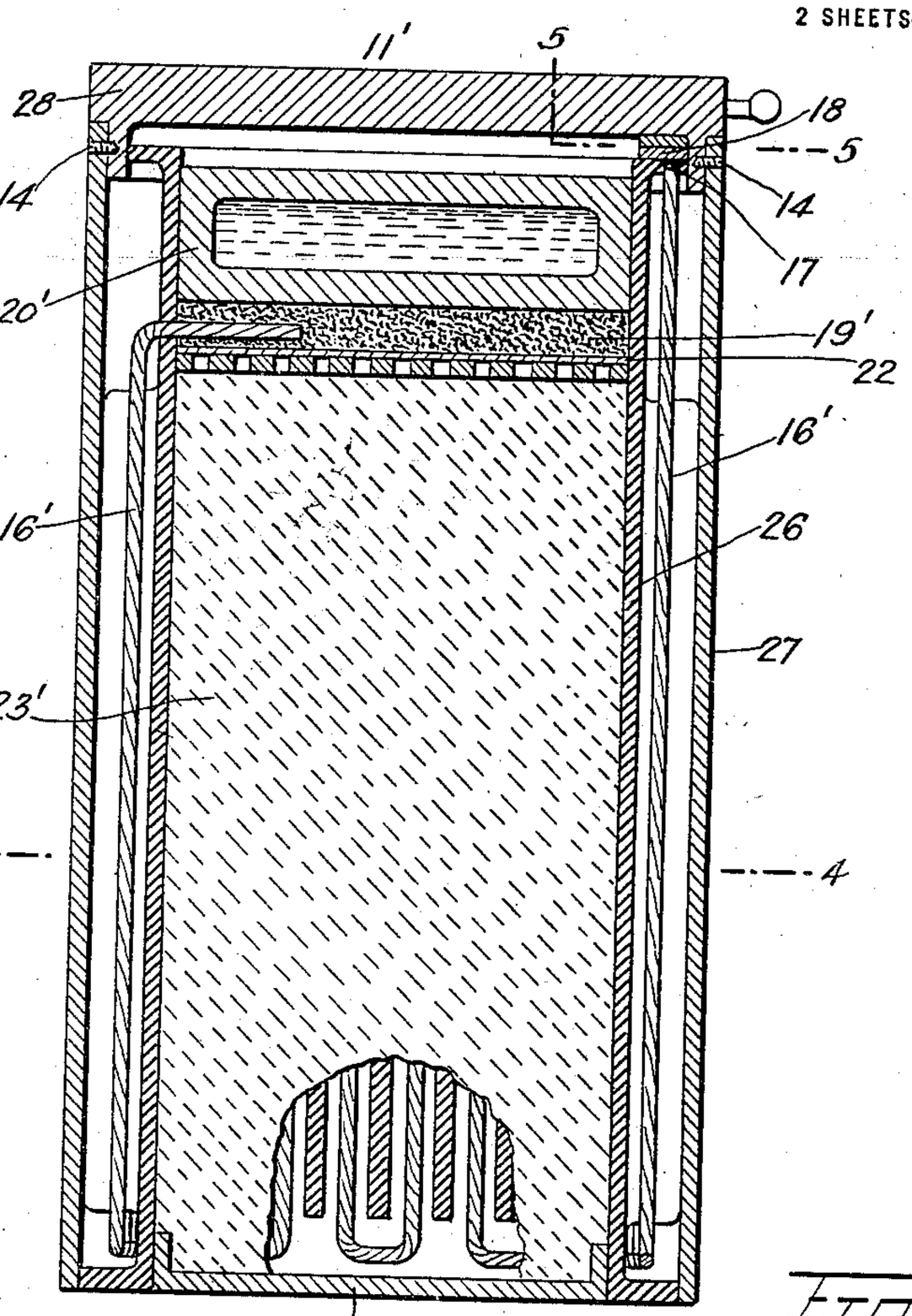


Fig. 4.

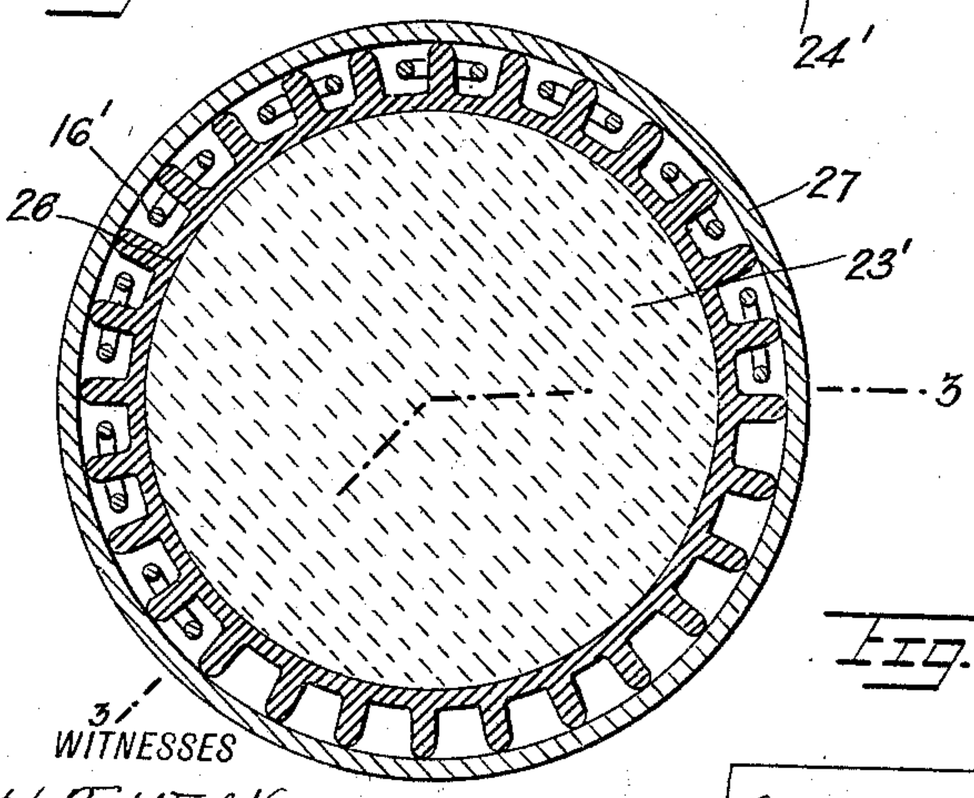


Fig. 5.

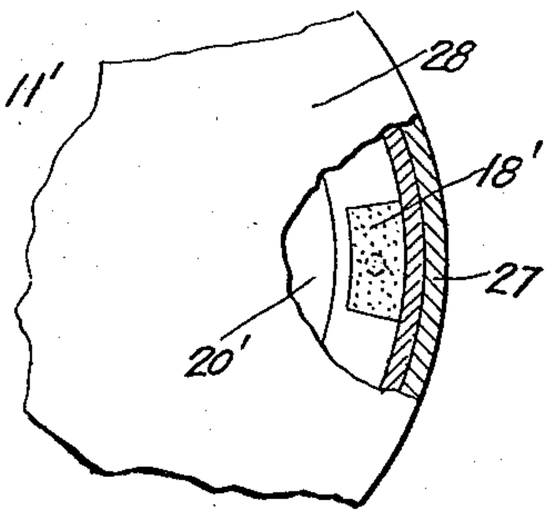
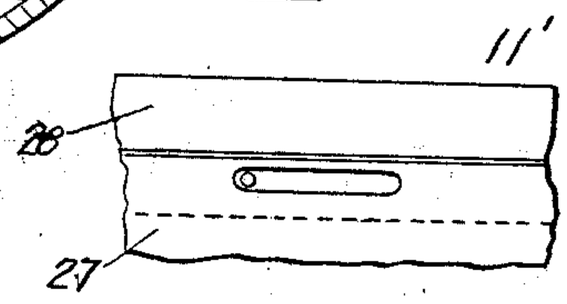


Fig. 6.



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UNITED STATES PATENT OFFICE.

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DELAY-ACTION DETONATOR.

1,298,466. Specification of Letters Patent. Patented Mar. 25, 1919.

Application filed January 30, 1918. Serial No. 214,469.

To all whom it may concern:

Be it known that I, PHILIPPO L. E. DEL FUNGO-GIERA, a citizen of Switzerland, and a resident of Pelham, Pelham Woods, in the county of Westchester and State of New York, have invented a new and Improved Delay-Action Detonator, of which the following is a full, clear, and exact description.

This invention relates to high explosive devices with respect to either military or commercial uses.

Among the objects of the invention is to provide an improved detonator, equipped with a slow or time controlled fuse, and associated with improved means to transmit the effect of the fuse to the main charge of high explosive.

With the foregoing and other objects in view the invention consists in the arrangement and combination of parts hereinafter described and claimed, and while the invention is not restricted to the exact details of construction disclosed or suggested herein, still for the purpose of illustrating a practical embodiment thereof reference is had to the accompanying drawings, in which like reference characters designate the same parts in the several views, and in which—

Figure 1 is a longitudinal sectional view of a high explosive shell for military purposes equipped with my improvement.

Fig. 2 is a cross sectional view of the same on the line 2—2.

Fig. 3 is a longitudinal sectional view of a modified form of the invention designed particularly for civil or commercial purposes.

Fig. 4 is a cross section of the same on the line 4—4 of Fig. 3.

Fig. 5 is a partial plan view and partial sectional detail on the line 5—5 of Fig. 3; and

Fig. 6 is a detail in side elevation of the parts shown in Fig. 5 and indicating the finger piece for rotating the cap to ignite the friction end of the fuse.

Referring now to the first form of the invention I show a shell 10 of any suitable size or design provided with a head 11 in which is fitted at the point a nose 12 supported resiliently by means of a coil spring 13 surrounding the same within the head and holding it projected in position to impinge against any relatively solid object and so to be forced backward or inward when the safety screw or screws 14 are loosened.

The main body of the shell is designed to be filled with any suitable high explosive, and at any convenient place within the shell is located my improved detonator indicated as a whole at 15.

16 indicates a fuse of any desired effective length according to the predetermined time for the detonation to take place. The outer end of the fuse is fitted with any suitable friction device 17 which will act similar to an ordinary match in connection with a friction surface 18 carried by or within the nose 12 providing for the ignition of the outer end of the fuse as a result of the inward movement of the nose at the time of impact.

At the other end of the fuse within the detonator structure is located a quantity of black powder 19, or its equivalent, adjacent to which is a closed container 20 filled with some powerful chemical re-agent 20′ such for instance as sulfuric acid. This container 20 is formed of some suitable substance not subject to attack by the re-agent within it but which responds readily to the action of the ignited black powder whereby the container is melted or reduced and the acid therein is set free to initiate the ignition of the high explosive 21 contained in or adjacent to the detonator. As a practical means for holding this charge of acid I prefer to use a substance in the nature of paraffin whereby the chemical will be held reliably and for any length of time until the paraffin is melted by external heat. When the fuse is ignited as already explained and burned so as to ignite the black powder the heat therefrom melts the paraffin and the layer or diaphragm of foil 22 that may be arranged between the parts just referred to and the main charge of high explosive 21. Thus the re-agent is set free to act upon the high explosive causing the detonation thereof.

As practised in the form of the invention shown in Fig. 1 the high explosive 21 communicates its force immediately to the main charge 23 in the shell exterior to the detonator 15. The provision of the high explosive 21 within the detonator is for convenience in assemblage of the apparatus.

The commercial form of the invention shown in Fig. 3 is designed for use in blasting or other analogous civil pursuits. This

form of the invention comprises a casing having inner and outer walls 26 and 27, the main space in which is filled with a high explosive 23′ held in at one end by means of a plug or wad 24′ and at the other end with a detonator head 11′. This head includes a cap 28 adapted to be rotated or otherwise moved by the operator for the purpose of igniting the friction end 17 of a time fuse 16′ in connection with a friction surface 18′, at any time after the safety screw or screws 14 are loosened.

Between the cap 28 and the high explosive 23′ are arranged the detonating mediums including a mass of black powder 19′ and the container 20′ and between the black powder and the high explosive is arranged a layer or film of foil 22.

In this form of the invention I provide a time fuse 16′ of considerable length which from the ignition head 17 is extended in convolutions lengthwise of the shell and between the inner and outer walls 26 and 27 thereof. The number of folds or convolutions may be few or many depending upon the time desired for the detonation. The opposite or inner end of the fuse leads into the black powder for the ignition thereof, which in burning melts the paraffin and sets the acid free to initiate the firing of the high explosive. In the form of the invention shown in Fig. 1 the chamber provided between the hose 12 and the coiled fuse may be filled with some suitable chemical serving as a smoke producer and as a cushion. For this purpose I suggest the use of some chemical including mono-nitro-naphthalene.

I claim:

1. In a device of the character set forth, the combination with a container charged with high explosive, a fuse and means to ignite the fuse, of detonating means including a charge of slow explosive into which the fuse leads to fire it, a chemical re-agent adapted to initiate the detonation of the high explosive and a fusible container for the re-agent adjacent to the slow explosive and adapted to be melted thereby to free the re-agent.

2. In a device of the character set forth, the combination with a shell, a time fuse within the shell, a mass of high explosive within the shell and means to control the ignition of the outer end of the fuse, of detonating means for the high explosive and to which the inner end of the fuse leads, said detonating means including a quantity of black powder to be fired by the fuse, a quantity of sulfuric acid and a fusible container for the acid adjacent to the black powder whereby the acid will be freed when the black powder acts to melt the container.

3. In a device of the character set forth, the combination of a shell, a high explosive within the shell, of detonating means for the high explosive, said detonating means including a combustible material, manually controlled means to ignite the combustible material, and a chemical re-agent set free to ignite the high explosive as a direct and immediate result of the combustion of said material.

PHILIPPO L. E. DEL FUNGO-GIERA.