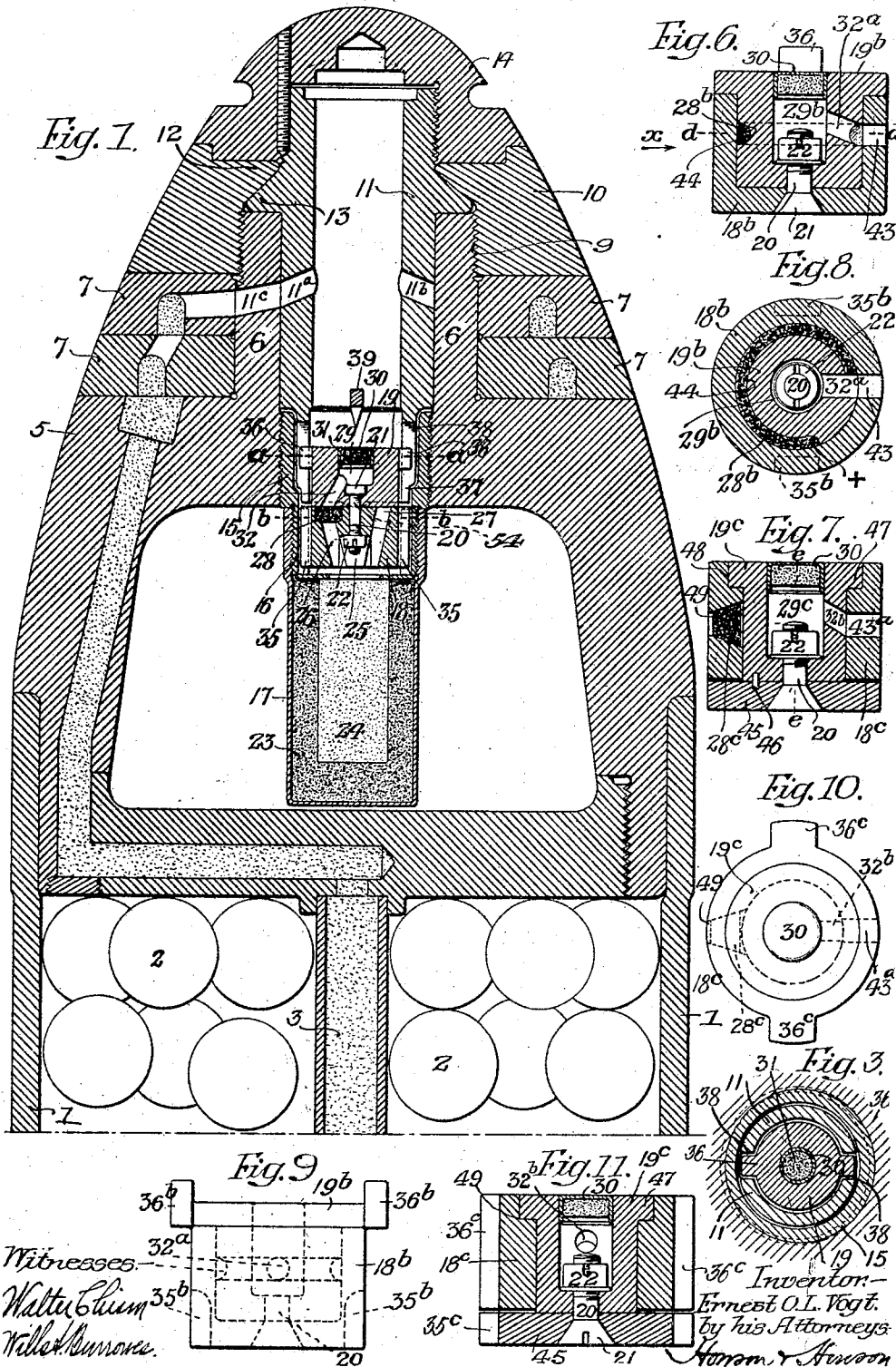


E. O. L. VOGT.
ADJUSTABLE DELAY DEVICE FOR PERCUSSION FUSES.
APPLICATION FILED NOV. 18, 1911.

1,057,305.

Patented Mar. 25, 1913.

2 SHEETS—SHEET 1.

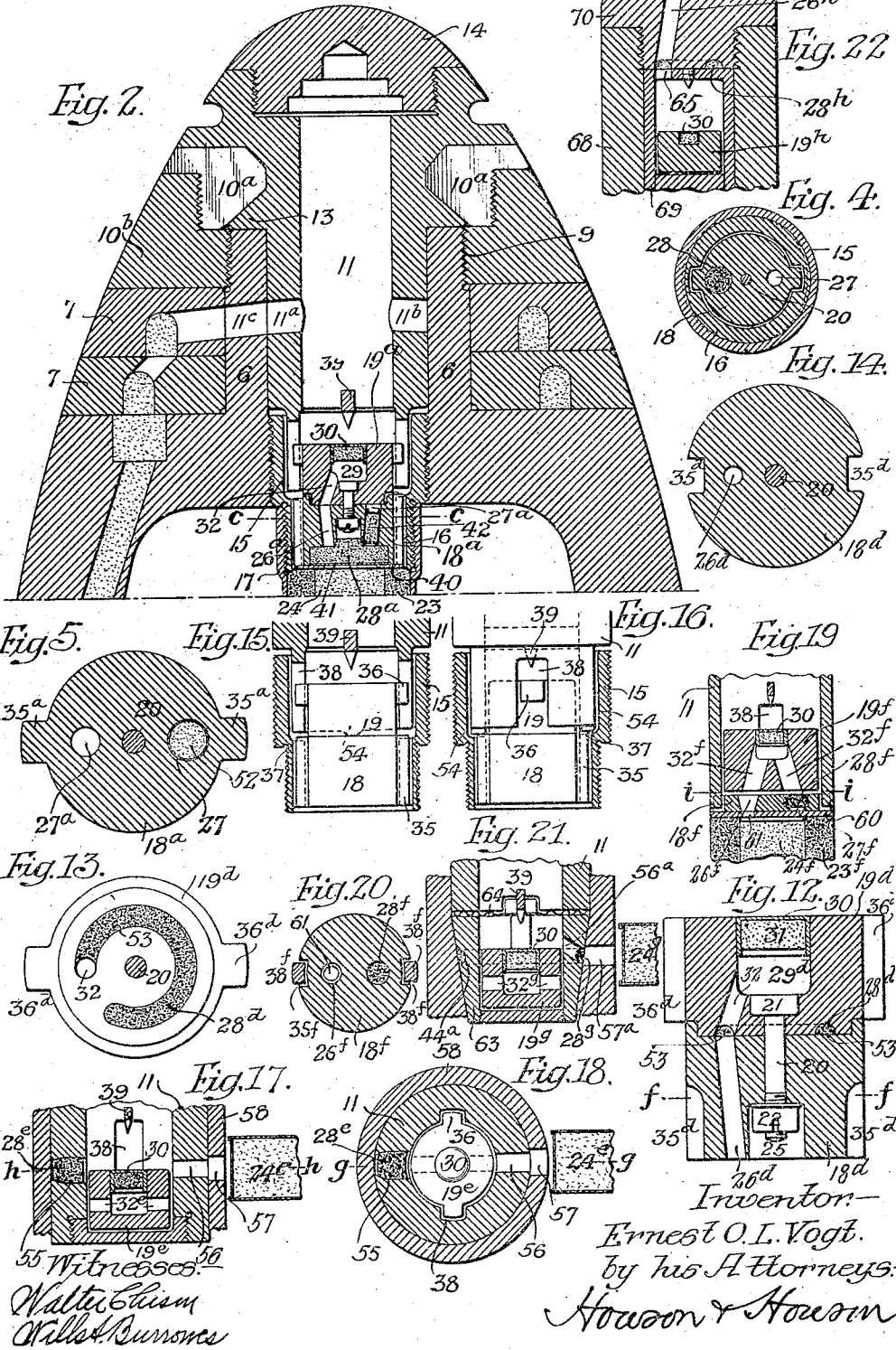


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2 SHEETS-SHEET 2.



UNITED STATES PATENT OFFICE.

ERNEST OTTO LEOPOLD VOGT, OF PHILADELPHIA, PENNSYLVANIA.

ADJUSTABLE DELAY DEVICE FOR PERCUSSION-FUSES.

1,057,305.

Specification of Letters Patent.

Patented Mar. 25, 1913.

Application filed November 18, 1911. Serial No. 661,152.

To all whom it may concern:

Be it known that I, ERNEST OTTO LEOPOLD VOGT, a subject of the Emperor of Germany, having declared my intention of becoming a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Adjustable Delay Devices for Percussion-Fuses, of which the following is a specification.

My invention relates to means for effecting delay in the explosion of projectiles upon impact of the same.

The essential feature and object of my invention is the provision of adjustable means for causing delay and for varying the extent of the delay of the explosion; that is to say, lengthening the interval between impact of the projectile, with the consequent ignition of the percussion primer and the actual explosion of such projectile.

My improved fuse construction, involving the employment of an adjustable delay device, is intended for use with shells, universal projectiles, &c., and a further object of my invention is the provision of a structure made in a plurality of parts, movable with respect to each other, whereby movement of one or more of said parts with respect to the rest of the structure will change the fuse from a non-delay action fuse to a delay action fuse.

These and other features of my invention are more fully described hereinafter, reference being had to the accompanying drawings, in which:

Figure 1, is a sectional view of the upper part of a "high explosive shrapnel" of the Ehrhardt-van Essen type equipped with a combination fuse having means, embodying my invention, for delaying or retarding the detonation of the high explosive charge upon impact; Fig. 2, is a similar view illustrating a modified construction of the fuse forming the subject of my invention; Figs. 3 and 4, are sectional plan views on the lines $a-a$ and $b-b$, respectively, Fig. 1; Fig. 5, is a sectional plan view on the line $c-c$, Fig. 2, slightly enlarged; Figs. 6 and 7, are sectional elevations of other forms of the percussion elements, illustrating modifications within the scope of my invention; Fig. 8, is a sectional plan view on the line $d-d$, Fig. 6; Fig. 9, is a side elevation of the structure shown in Fig. 6, looking in the direction of the arrow x ; Fig. 10, is an invert-

ed plan view of the structure shown in Fig. 7; Fig. 11, is a sectional elevation on the line $e-e$, Fig. 7; Fig. 12, is a sectional view of a fuse somewhat like the structure shown in Fig. 1, illustrating a further modification within the scope of my invention; Fig. 13, is an inverted plan view of the upper part of the structure shown in Fig. 12; Fig. 14, is a sectional view on the line $f-f$, Fig. 12; Fig. 15, is an external view of the percussion plunger shown in Fig. 1; Fig. 16, is a view similar to Fig. 15; the upper part of the percussion plunger being turned 90°; Fig. 17, is a sectional view illustrating another form of delay device within the scope of my invention, taken on the line $g-g$, Fig. 18; Fig. 18, is a sectional plan view on the line $h-h$, Fig. 17; Fig. 19, is a sectional view illustrating a modified form of the structure shown in Fig. 17; Fig. 20, is a sectional view on the line $i-i$, Fig. 19; Fig. 21, is a view illustrating still another form of delay device within the scope of my invention, and Fig. 22, is a view of a base fuse having a delay device similar in character to that shown in Fig. 12.

My invention involves, broadly speaking, a plurality of elements, usually a pair, disposed within the fuse sleeve, which elements are revoluble or movable with respect to each other so that the relation of certain channels containing delay powder may be changed or adjusted as desired.

In the structure illustrated in Fig. 1, of the drawings, 1 represents the case of the shrapnel part of a "high explosive shrapnel" of the Ehrhardt-van Essen type, containing the usual balls 2, and a central tube 3 leading to the shrapnel bursting charge, (not shown in the illustration), disposed at the lower end of the projectile. The shell part of the projectile, indicated at 5, is located on top of the shrapnel part and forms at its upper end the body of the combination point-fuse. The upper portion of the shell part 5 is reduced at 6 and is centrally bored for the reception of the concussion and percussion elements, &c. The usual time train rings 7, 7, are carried by said reduced portion and the outer end of the latter may be threaded at 9 for the reception of a ring 10 which holds in place a rotatable or revoluble sleeve 11 (forming a part of my invention) which fits within the central bore of the reduced portion 6, and

is in operative engagement with the percussion plunger. The ring 10 may have an overhanging flange 12 for engagement with a flange 13 on said sleeve 11. The outer end or point-cover 14 of the projectile may be threaded onto said sleeve 11. In the lower end of the central bore of the shell-part 5, a sleeve 15 is threaded, having a reduced lower end 16, also threaded, onto which a cup-shaped element 17 may be screwed, and in the space provided by said sleeve 15 the percussion plunger forming the subject of my invention is mounted.

In Figs. 1, 3 and 4, I have shown my improved delay device for ordnance fuses as applied to an Ehrhardt-van Essen high-explosive shrapnel, and in this structure, as shown, the sleeve 11 is held in place by a single ring 10 in lieu of a two-part ring 10^a, and the filler-piece 10^b, as shown in Fig. 2. In Figs. 1 and 2, I have omitted the concussion elements, safety devices, &c., disposed within the sleeve 11, since they are of ordinary construction and have no bearing upon the delay device forming the subject of my invention and employed in connection with the percussion plunger. In this arrangement, the elements of the percussion plunger are indicated at 18 and 19; being retained in adjustable or movable connection with each other by suitable means such as a screw bolt 20, having a suitable head 21, and a retaining nut 22. Below the percussion plunger the detonator is located, consisting of a body of fulminate 23, and a body of high explosive 24. The lower part of the member 18 may be recessed at 25 for the reception of the nut 22, and communicating with this recess are flame passages 26 and 27, one of which contains, in the upper portion of said member adjacent the member 19, a body of slow-burning powder indicated at 28 and providing delay. The upper member 19 is recessed at 29, for the reception of a percussion primer 30, having the usual priming charge 31; such portion of the plunger being also provided with a passage 32 in communication with the recess 29 and adapted for registry with either of the flame passages 26 or 27 of the lower member 18 of the plunger structure.

As shown in Fig. 1 of the drawings, the plunger is in the delay position; the flame passage 27 being closed and the flame passage 26 containing the delay powder being in registry with the passage 32, so that flame from the percussion primer must burn through such body of powder before it can pass through the passage 26 to the detonator consisting of the fulminate 23 and the high explosive 24. When the plunger is in the reverse position with the passage 32 in registry with the passage 27, the flame from the percussion primer is free and unobstructed and there is no delay.

Each portion of the plunger body may be provided with ribs; the lower part 18 having ribs 35 and the upper part having ribs 36. The ribs of the lower part 18 may engage recesses 37 formed in the sleeve 15, while the ribs of the upper part 19 may engage recesses 38 formed in the sleeve 11. By this construction, rotative movement imparted to said sleeve 11 will effect turning of the element 19 with respect to the element 18; the latter being held during such turning movement by engagement of its ribs 35 with the grooves 37 of said sleeve 15. Movement of 180° must be imparted to the sleeve 11 to change the plunger structure from the delay to the non-delay position, or vice versa. It will be understood, of course, that the members 18 and 19 may be grooved instead of being ribbed, with the sleeves 11 and 15 ribbed to engage said grooves.

Fixed within the sleeve 11 is a firing pin 39 disposed normally in such position that when the percussion plunger structure moves forward upon impact of the projectile, said pin will pierce the percussion primer, with the consequent discharge of flame therefrom.

In Figs. 2 and 5, I have shown a modified construction of the under part of the percussion plunger, indicated at 18^a; the upper part 19^a of the same being like the construction shown in Fig. 1. In this arrangement, the member 18^a has a pair of flame passages 26^a and 27^a, with a body of high explosive 28^a forming the delay powder and disposed in the lower part of the said member 18^a. This powder may be retained in place by a suitable cover of sheet metal, indicated at 40, held to the member 18^a in any approved manner; between which and the powder a sheet of paper or tin-foil, 41, may be placed. A body of fulminate 42 may be located within one of the flame passages, 27^a, for instance. If the flame passage 32 is in registry with the flame passage 26^a, delay occurs when the percussion primer 30 is exploded since the high explosive delay powder 28^a must burn off before the fire stream can get to the detonator. If the passages 32 and 27^a are in communication, however, there is non-delay because the high explosive delay powder 28^a becomes detonated by the body of fulminate 42, (fulminate of mercury for instance), contained in said passage 27^a.

In Figs. 6, 8 and 9, I have shown another form of structure in which the length of the delay is adjustable. In this construction the members 18^b and 19^b are disposed in nested relation; the member 18^b having a flame port or vent 43 at one side adapted to register with a flame passage 32^a formed in the member 19^b and leading from a recess 29^b therein which contains the percussion primer 30, of usual type, or with any point on the circumference of a groove 44 par-

tionally surrounding the shell of the member 19^b and containing a body of delay powder 28^b. The longest delay is obtained if the point + of the body of delay powder is located in front of the vent 43, while the shortest delay, *i. e.*, zero, or non-delay, is obtained by the use of the structure in the illustrated position. In this construction, the member 18^b is recessed at 35^b for engagement by lugs which may be carried by the sleeve 15 in lieu of recessing the same, while the upper member 19^b carries lugs 36^b adapted to engage the recesses 38 of the sleeve 11. Movement of such sleeve, therefore, will effect movement of the member 19^b independently of the member 18^b. These parts are loosely confined together by the usual bolt 20 and nut 22 so as to be capable of rotative movement with respect to each other and yet move as a unit plunger upon impact of the projectile.

In the structure shown in Figs. 7, 10 and 11, the plunger structure is composed of two main elements 18^c and 19^c and a supplemental base element 45 confined to the element 19^c by the usual bolt 20 and nut 22 and retained for movement with said member by a dowel 46, or other suitable means, while the member 19^c is flanged at 47 for engagement with a recess 48 formed in the member 18^c. In this arrangement the member 19^c has a flame passage 32^b adapted to register with a port or vent 43^a formed in the wall of the member 18^c, or with a recess 49 in said wall containing a body 28^c of delay powder. To effect movement of the part 18^c with respect to the part 19^c, said parts are provided with ribs 36^c and 35^c for engagement, respectively, with the grooves of the sleeves 11 and 15. By turning the part 18^c either the vents 32^b and 43^a may be connected, or the powder grain 28^c in said recess 49 may be placed in registry with the vent 32^b, thus providing for delay in action.

The structure shown in Figs. 12, 13 and 14, combines features of the structure shown in Figs. 1 and 2, with those of the structure shown in Figs. 6, 8 and 9. The lower member 18^d has a single flame passage 26^d, while the upper member 19^d is of substantially the same construction as the member 19 or 19^a, excepting that its under surface where it joins the member 18^d is grooved at 53 for the reception of a body of delay powder, indicated at 28^d. In the illustration the non-delay position is shown; the flame passages 32 and 26^d being in registry. Delay is occasioned by turning the member 19^d with respect to the member 18^d, thereby necessitating the burning of more or less of the delay powder 28^d before the flame can reach the passage 26^d. This structure is provided with grooves and ribs in substantially the same manner as the structure shown in Figs. 6, 8 and 9.

In Fig. 15, I have shown an external view of the percussion plunger in its position within the sleeves 11 and 15, and in Fig. 16, I have shown my improved structure in a position to be assumed when it acts as a transport safety device. When the sleeve 11 is given a quarter turn or movement of 90°, convex projecting portions 54, or the like, on the under side of sleeve 11 lie over the ribs of the lower member of the percussion plunger; preventing forward movement of the latter and avoiding an untimely ignition of the percussion primer 30 by means of the firing pin 39, and also an ignition of the time train rings is prevented because neither of the vents 11^a and 11^b of the sleeve 11 is in communication with the passage 11^c.

In Figs. 17 and 18, I have shown a construction in which the percussion plunger consists of one part, 19^e, with flame passages 32^e. In this instance the delay powder grain 28^e is carried in a recess 55 formed in the sleeve 11. In the position illustrated in the drawing we have non-delay because passages 56 and 57 leading to the detonator 24^e are in registry. By turning said sleeve 11, 180° the delay powder grain 28^e is placed in registry with the passage 57; thus delay is obtained because the powder grain 28^e must burn off before the flame from the percussion primer can reach the detonator 24^e. In lieu of the delay powder grain 28^e, a train ring as illustrated in Figs. 6 and 8, can be used, and such train may be located either on the outer surface of the sleeve 11, or on the inner surface of the inclosure 38 carrying said detonator 24^e.

In Figs. 19 and 20, I have shown a construction in which a comparatively strong sheet cover 60 of suitable material may be fixed to the detonator comprising the fulminate 23^f and the high explosive 24^f, which serves to prevent an untimely ignition of said detonator when the delay is adjusted. The percussion plunger is indicated at 19^f, having flame passages 32^f, while the part 18^f, corresponding substantially to the part 18 and 78^a, of Figs. 1 and 2, is fixed and has a pair of flame passages 26^f and 27^f, one of which contains the delay powder grain 28^f. The member 18^f, with the member 19^f is rotatable upon movement of the sleeve 11, suitable engaging means of the character before referred to being provided, but only the percussion member 19^f moves longitudinally with respect to said sleeve 11. In the position indicated by the drawings there is non-delay, since the flame from the percussion primer can pass through the flame passage 26^f and the passage 61 in said sheet cover 60 to the detonator.

In Fig. 21, I have shown a modification of the construction illustrated in Figs. 17 and 18, in which a one-part percussion plunger

19^a with flame passages 32^a, is employed. The under part of the sleeve 11 is advantageously of conical shape, as indicated at 63, if a time train is used in order to obtain ob-
 5 turation. If desired, the conical part may be a separate piece, as shown, which may be moved by the sleeve 11; suitable engaging parts being provided. The conical part does not move forward upon the impact, and be-
 10 tween the sleeve 11 and the said conical part I may place an elastic washer 64. This conical part is grooved at 44^a and contains a body of delay powder 28^a; said conical part being also provided with a passage 56^a
 15 which may register with a passage 57^a of the inclosure 58^a. A detonator 24^a is disposed opposite the passage 57^a. There is non-delay in the position shown. By adjusting the conical part so as to bring some portion of
 20 the delay powder opposite said passage 57^a, delay to the desired extent may be obtained.

In Fig. 22, I have shown the application of my improved delay device similar to that shown in Fig. 12, &c., to base fuses. In the
 25 illustration, non-delay is provided for; the longest delay being obtained when the end of the time train of delay powder 28^b is brought into registry with a flame passage 65. The part 68 is fixed to the bottom of the
 30 projectile, while the part 69 can be turned from the outside of the projectile by means of a suitable key. A one-part percussion plunger 19^b having the usual percussion
 35 primer 30 is employed and the member 70 carrying the time train 28^b is provided with a flame passage 26^b.

In the structures shown in Figs. 1 and 2, the body of the fuse and the projectile head consist of one part. The several construc-
 40 tions of my improved delay devices can be used, of course, if the fuse body is a separate part. Further, all of the constructions shown can be used with but slight modifica-
 45 tion for base fuses, of substantially the same character as that indicated in Fig. 22.

I claim:

1. The combination with an explosive shell, of a centrally located revoluble sleeve adapted for the reception of concussion ele-
 50 ments, safety devices, &c., and a movable percussion plunger consisting of two parts, one of which is rotatable with respect to the other, partially disposed in the lower por-
 55 tion of said sleeve.

2. The combination with a shell, universal projectile or the like, of a centrally located revoluble sleeve adapted for the reception of concussion elements, safety devices, &c.,
 60 a firing pin carried by said sleeve, and a movable percussion plunger consisting of two parts, one of which is rotatable with respect to the other, partially disposed in the lower portion of said sleeve, and carry-
 65 ing an explosive primer.

3. The combination with an explosive

shell, of a centrally located revoluble sleeve adapted for the reception of concussion ele-
 70 ments, safety devices, &c., a movable percussion plunger consisting of two parts, one of which is rotatable with respect to the other, partially disposed in the lower por-
 75 tion of said sleeve and having a percussion primer, and detonating means for said primer carried by said sleeve.

4. The combination with a shell, universal projectile or the like, of a centrally located revoluble sleeve adapted for the reception of concussion elements, safety devices, &c.,
 80 a firing pin carried by said sleeve, a movable percussion plunger consisting of two parts, one of which is rotatable with respect to the other, partially disposed in the lower portion of said sleeve, and a centrally dis-
 85 posed percussion primer carried by said plunger.

5. The combination with an explosive shell having time train rings, of a centrally located revoluble sleeve disposed within said time train rings, said sleeve adapted for the
 90 reception of concussion elements, safety de-
 95 vices, &c., a compound percussion plunger longitudinally movable in said sleeve, a primer carried by said percussion plunger, and means carried by said sleeve for rotat-
 100 ing part of said percussion plunger, and a firing pin carried by said sleeve.

6. The combination with a shell, universal projectile or the like having the time train rings of a time fuse, of a centrally located revoluble sleeve disposed within the same,
 105 said sleeve adapted for the reception of con-
 110 cussion elements, safety devices, &c., a per-
 115 cussion plunger comprising a plurality of connected parts longitudinally movable in said sleeve, a primer carried by said percus-
 120 sion plunger, means for detonating the same, and means carried by said sleeve for ro-
 125 tating part of said percussion plunger.

7. The combination with an explosive shell having time train rings, of a centrally located revoluble sleeve disposed within said time train rings, said sleeve containing con-
 130 cussion elements, safety devices, &c., a two-
 135 part percussion plunger longitudinally mov-
 140 able with respect to said sleeve and partially
 145 disposed in the lower part of the same, said plunger having a centrally located primer, and means carried by said sleeve for moving the upper part of said plunger with respect to the other.

8. The combination with a shell, universal projectile or the like having the time train rings of a time fuse, of a centrally located revoluble sleeve disposed within the same,
 150 said sleeve adapted for the reception of con-
 155 cussion elements, safety devices, &c., a two-
 160 part percussion plunger longitudinally mov-
 165 able with respect to said sleeve, a centrally located primer carried by said plunger, means carried by said sleeve for moving one

part of said percussion plunger with respect to the other, and a firing pin carried by said sleeve.

9. The combination, with a shell or universal projectile having the usual time train elements, of a revoluble sleeve centrally located in the point of said projectile for containing concussion elements, and a movable percussion plunger carried at the lower end of said sleeve and revoluble by turning the sleeve to delay or non-delay positions, said sleeve having a plurality of vents for communication with the time trains when the percussion plunger is in the delay or non-delay position.

10. The combination with a shell having the usual time train elements, of a movable percussion plunger comprising a plurality of elements, one of which is rotatable with respect to the rest of the percussion plunger structure, a centrally located primer carried by said plunger, and a revoluble sleeve centrally located with respect to said shell and disposed inside the time train rings, the lower end of said sleeve surrounding and being operatively connected to the rotatable element of the percussion plunger to effect movement of the same.

11. The combination with a shell having the usual time train elements, of a movable percussion plunger comprising a plurality of elements, one of which is rotatable with respect to the rest of the structure, a revoluble sleeve centrally located with respect to said shell and operatively connected to said plunger to move the same, a percussion primer carried by said plunger, and a firing pin for engagement therewith carried by said revoluble sleeve.

12. The combination, in a percussion plunger for shells and other explosive projectiles, of a plurality of members, one of which is rotatable, means connecting said members together, a percussion primer carried by the rotatable member, said member having a channel leading from said percussion primer, a plurality of channels in the non-rotatable member adapted to register with the percussion primer channel, and a body of slow-burning powder disposed in one of the channels of the non-rotating member, the rotatable member being movable with respect to the other whereby either channel of the latter may be brought into registry with the percussion primer channel.

13. The combination, in an impact or percussion plunger for shells or other explosive projectiles, of a plurality of members, one of which is rotatable, means connecting said members together, a centrally located percussion primer carried by the rotatable part of said plunger, said part having a channel leading from said percussion primer, a plurality of channels in the non-rotatable member adapted to register with

the percussion primer channel, and a body of slow-burning powder disposed in one of the channels of said non-rotating member.

14. The combination, in an impact or percussion fuse for shrapnel or other explosive projectiles, of a plurality of members, one of which is rotatable, means connecting the same together, a percussion primer carried by the rotatable member, said member being channeled and the non-rotatable member having a plurality of channels registrable with the channel of the rotatable member, and a body of slow-burning powder disposed in one of said channels.

15. The combination, in a percussion fuse for shells and other explosive projectiles, of a plurality of members, one of which is rotatable, means connecting the same together, a percussion primer carried by the rotatable member, said member having a channel leading from the percussion primer, a plurality of channels in the other member adapted to register with the percussion primer channel, a body of slow-burning powder disposed in one of said channels, and means whereby the rotatable member may be moved to bring either of said channels into registry with the channel leading from the percussion primer.

16. The combination, in a percussion fuse for shells or other explosive projectiles, of a plurality of members, one of which is rotatable, means connecting the same together, a percussion primer carried by the rotatable member, said member having a channel leading from the percussion primer, a plurality of channels in the other member adapted to register with the percussion primer channel, a body of slow-burning powder disposed in one of said channels, a sleeve-like element receiving said percussion fuse, and means carried by said sleeve-like element and coacting with the rotatable member whereby the latter may be moved to bring either of said channels into registry with the channel leading from the percussion primer.

17. The combination, in a percussion plunger, of a plurality of elements, means connecting said elements together permitting movement of one with respect to the other, both of said elements being channeled, one having one channel and the other having two, a centrally located percussion primer carried by one of said elements and communicating with its channel, a body of slow-burning powder carried in one of the channels of the other element, and means for positioning the channel leading from the percussion primer with respect to either channel of the other element.

18. The combination, in a percussion plunger, of a plurality of elements, means connecting said elements together and permitting movement of the same with respect

to each other, means for holding one of said members while the other is moved, both of said elements being channeled and one of said elements having a pair of channels, a
 5 percussion primer carried by one of said elements and communicating with its channel, a body of slow-burning powder carried in a channel of the other element, and means for regulating the position of said
 10 elements with respect to each other whereby either channel of the one may be brought into registry with the percussion primer channel.

19. The combination with a shrapnel, universal projectile or the like having the time train rings of a time fuse, of a centrally located revoluble sleeve disposed within the same, said sleeve adapted for the reception of concussion elements, safety devices, &c.,
 20 a two-part movable percussion plunger disposed in said sleeve, a percussion primer carried by said plunger, a firing pin carried by said sleeve, means below said sleeve receiving the lower part of the percussion
 25 plunger, and a delay device disposed in said lowermost part of the percussion plunger, said upper part of the plunger being revoluble by the sleeve to delay and non-delay positions while the lower part is held.

30 20. The combination with a shell, universal projectile or the like having the time train rings of a time fuse, of a centrally located revoluble sleeve disposed within the same, said sleeve adapted for the reception

of concussion elements, safety devices, &c., 35
 a movable percussion plunger disposed in said sleeve, said percussion plunger being made in a plurality of parts, a percussion primer carried by said plunger, a firing pin carried by said sleeve, a tubular member 40
 disposed below said sleeve and receiving the lower end of the percussion plunger and holding the same against turning, and a delay device carried by the lowermost part of the percussion plunger, said upper part of 45
 the plunger being revoluble by the sleeve to delay and non-delay positions.

21. The combination, in the percussion plunger, of a plurality of separable elements butted together, axially disposed 50
 means connecting said elements together and permitting movement of either with respect to the other, both of said elements being channeled, a centrally disposed percussion primer carried by one of said elements 55
 and communicating with a channel thereof, and a body of slow-burning powder carried by one of said elements and movable therewith into delay and non-delay positions with respect to the channel of the other ele- 60
 ment.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

ERNEST OTTO LEOPOLD VOGT.

Witnesses:

MURRAY C. BOYER,
 Jos. H. ...