DETONATORS, IGNITERS, PRIMERS, AND OTHER INITIATING DEVICES USED FOR NONMILITARY AND MILITARY PURPOSES

Preface

In the pages which follow, this subject is treated separately for items used for nonmilitary and military purposes. As the subject is very extensive, it is separated into several sections. The references and additional references given at the end of this compilation apply to all sections

The items used for military purposes include those used for small arms ammunition, artillery ammunition, rocket ammunition, aircraft bombs, land & sea mines, grenades, demolition devices and pyrotechnic devices. As some items (such as detonators, primers, etc) can be used in several kinds of ammunition our write-up might contain some repetitions

Section 1
DETONATORS, IGNITERS AND PRIMERS USED FOR NONMILITARY PURPOSES

Part A
NonmiIitary Igniters

igniters, which include devices called squ~bs, lighters and firing devices, etc are used for initiating expl or pyrotechnic compns whose nature is such that it is desirable to use flame or flash for their initiation and not a shock as produced by primers or detonators. , Explosives of this kind are known as deflagtating or iow explosives. BkPdr and smoke-"less propellants are examples. The simplest device for ignition is B ickford or Miner's safety fuse, described in Ref 44, p B1 12-L. In Ref JO, pp 915-101 is described the safety fuse and the following devices for igniting it: ordinary matches, lead spitter fuse lighter, ignitacord and quarry cord. The lead spitter /use lighter consists of a thin lead tubing filled with BkPdr and wound on. a feel. After cutting with a knife a piece of tubing, the powder is ignited with a match and lighted ' end approached to the open end of safety fuse. The continuous spit of flame of intense heat will ignite the fuse, making the slitting of fuse unnecessary. The pull wire fuse lighter consists of a paper tube closed at one end and contg an igniting device consisting of a striker compd on a wire which protrudes thtu the closed end. In use, the safety fuse

is inserted into the open end of the lighter until it slightly touches the wire. It is held in place by means of metal gripper teeth on the inside of the tube. Then the protruding wire is pulled and this ignites the striker compd and the fuse. The hot wire /use lighter consists of a wire covered with an ignition composition that but ns slowly with intense heat, and at a fairly steady rate. The device is lighted by a match and the flame is held against the freshly cut end of safety fuse. Ignitacord is a device cordlike in appearance which burns progressively along its length. The flame is short and hot and offers a means of lighting a series of safety fuses in the desired rotation. Two types, A & B, are manufd by the DuPont Co. The use of "" ignitacord "" is described in Ref 50, PP 130-33. Quarrycord is another COrdtype burning igniter designed mainly for firing a large number of quarry charges in secondary blasting. The use of "" quarrycord "" is described in Ref 50, pp 133-34. ""Secondary ary blasting ""~fo Ilows quarry blasting operations in order to break up large rock chunks and boulders into pieces sufficiently small to feed into crushers (Ref 50, p 347)
The DuPont Co makes also electric igniting devices, called electric squibs (Ref 50, pp 94-5). Three types of US electric squibs patented by Burrows et al, are described in Ref 44, pp B212 to B214
No description of British devices corresponding to US electric squibs is found in Brit books on explosives in our possession, such as Refs 36, 38 & 51. In Ref 38; p 59 is, however, a description of an electric device which probably serves the same purpose. It is an electric powder fuse, which consists of a thick paper tube contg a small chge of Blasting Powder (Brit for Black Powder or Gunpowder), with an ordinary lowtension fusehead fixed at one end. On passing electric current thru the fus"ehead it flashes and sets off the BkPdr in the tube, which can then ignite the main chge of BkPdr in the shot hole. This device was created so that electrical shot-firing methods could be used for initiating deflagrating expls like BkPdr
In the DuPont's Hdb (Ref 50, p 187), the device consisting of a paper cartridge of BkPdr in which a safety fuse is inserted is called black powder primer with safety fuse, and the device combining a BkPdr cartridge with an electric squib or cap is called black powder primer with electric squib or cap.

As these devices are used for igniting and not for detonating low expls like BkPdr, their correct names should be “ igniters “

Section 1, Part B
Nonmilitary Primers

Primers used for nonmilitary (commercial or industrial) purposes are devices which initiate high explosive charges (such as Dynamites) by shock produced on detonation of primary charges and not by a flash or flame as in the case of igniters
One of the simplest primers is a combination of “nonelectric cap “(Brit “ plain detonator ~ with safety fuse (Bickford fuse) and a cartridge of Dynamite, as shown in Fig 1. This combination is called in US

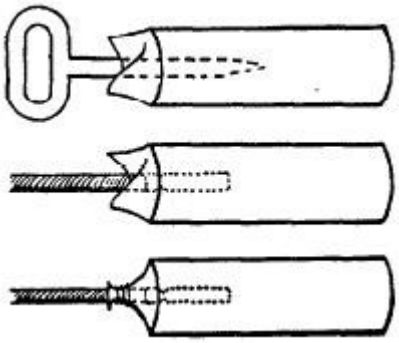

Fig 1 DYNAMITE PRIMER

“Dynamite primer “ and in Gt Britain “primer cartridge’1 For its preparation, one cuts across a safety fuse with a clean sharp knife (or fuse-cutter) a required length and inserts freshly cut end into open end of blasting cap. Using a proper crimping ted, the cap is crimped near its open end to hold the fuse securely in position. This combination is known in Gt Brit as “tapped fuse “j The next step is to open the Dynamite cartridge at one end and to make a hole with an Al, Cu, brass or wooden pricker, then to insert the cap into the hole and to tie the cartridge paper tightly around the fuse above the cap (Ref 38; p 71). Other methods of prepn of “Dynamite. cartridge “are given in Ref 50, pp 191-94
Electric blasting caps can be used in lieu of nonelectric ones for prepn of primer cartridges. For this, the hole is made in a cartridge of Dynamite as described above and, after inserting the cap, the electric wires of the cap are tied around the cartridge to prevent

the cap being withdrawn accidentally during loading or handling (See Fig 2) (Ref 3, p 72 and Ref .50, p193)

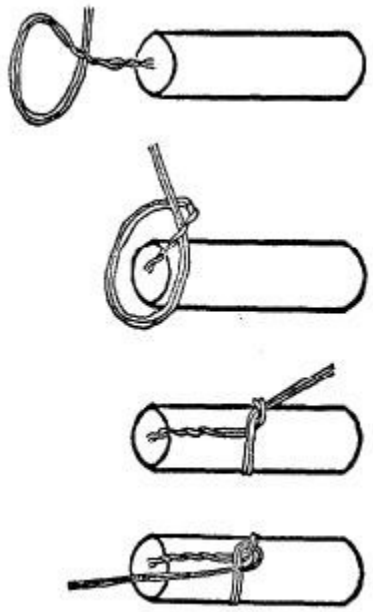

Fig 2 DYNAMITE ELECTRIC PRIMER

Dynamite primers with LEDC (low energy detonating cord) delay assemblies made by ‘the DuPont Co are described in Ref 50, pp 106-09 & 192-93. They are essentially ““nonelectric MS(microsecond) delay caps”~ The LEDC produces very little noise on detonation and for this reason can be used in highly populated areas. It is usually recommended for operations where bottom-hole initiation is desired and electric blasting caps cannot be used for fear of premature detonations from stray current or other extraneous electricity. These primers are assembled the same way as the ““capped fuse ““(See Fig I) ““EL-primers ““are listed in Ref 50, p 194 as ““ special non-nitroglycerin primers ““designed specifically for priming blasting agents in small diameter boreholes. Their physical appearance is much the same as small diameter Dynamite and the recommended methods of primer assembly are exactly the same as for Dynamite. Their compn is not given in Ref 50

‘“Sheathed primers “o consist of Dynamite cartridge primers inserted in cylindrical paper or cardboard containers of slightly larger ID than OD of cartridges. The caps may be either nonelectric combined with safety fuse, or electric. The sheath prevents the cap from coming out of the cartridge, adds

rigidity, and minimizes abuse during loading. These primers have particular merit when b oreholes are rough (Ref 50, pp 194-95) Dynamites and some other mining explosives may be initiated by means of a detonating /use, which acts by producing shock (instead of flash produced by safety fuse). This type of fuse is described in Vol 3 of Encycl under the name of ""Cord, Detonating "'(Ref 48, p C5 29) and under ""Detonating Cord ""(Ref 48, p D 103-R). A variety manufd by DuPont Co and known as ""Detacord ""is described in Ref 48, p D97-L, but noi listed in DuPont's Hdb (Ref 50). The ""detonating fuse "' manufd by the Ensign Bickford Co of Simsbuty, Connecticut known as "" Primacord "" or "" Primacord Bickford ""is described in Ref 48, p D103 and in Ref 50, pp 101-02. 'mP rimacords "oa re also manufd by the DuPont Co. Four types of "" Primacords "": ""Reinforced "j ""Plastic Reinforced "j "" Plastic Wtie Countered"; and '"ECord ""are described in Ref 50, pp 103-06 Detonating cords (fuses) are also used for military purposes. US military requirements and testing are described in Ref 48/ pp D104-R tO D107
desirable that the Primacord extend to the bottom of the borehole and therefore it should be attached to the first cartridge loaded into the hole. The cord will initiate every dynamite cartridge in contact with it. Primacord itself can be initiated by means of a blasting cap attached to outer end of the cord. TWO methods of prepn of primer cartridges with detonating fuse are shown on Fig 3

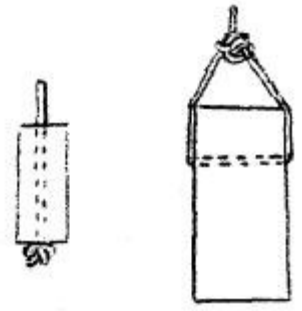

Fig 3 PRIMACORD PRIMER FOR DYNAMITE

Priming with "" Nitramon "" and '" Nitramex 3 ""primers is described m Ref 50, p 196-98. Since they are packed in metal containers, there is a potential hazard in loading them into a borehole following dynamite or other

conventional expls. They are intended only
for charges of ""blasting agents "" under most
conditions. They are waterproof
A commercial blasting agent is a cap
insensitive chemical compn or mixture, which
contains no NG and can be detonated only
when initiated with a high strength explosive
primer. DuPont offers two groups of cap insensitive
compns. The Ist group is classified
as ""oxidizing materials "" because they
contain no HE's, and are known as ""Nitrocarbo-
nitrates"1 Examples of this group are
""Nitramon "j "" Nitramite"1 and ""Nilite'1
The 2nd group which includes ""Nitramex ""
2H, HD & 3, as well as ""Tovex ""and "'Pel-
letol "" contain non-NG HE ingredients and
for this reason are not true "blasting agents 'j
but are similar to them because they are
cap-insensitive (Ref 50, p 47). No compns
of the above expls are given in Ref 50
Recommended methods of priming Dynamite
charges in boreholes are described in
Ref 50, pp 200-206.
diagrammatically on
D 736
They are shown here
Figs 4, 5 & 6

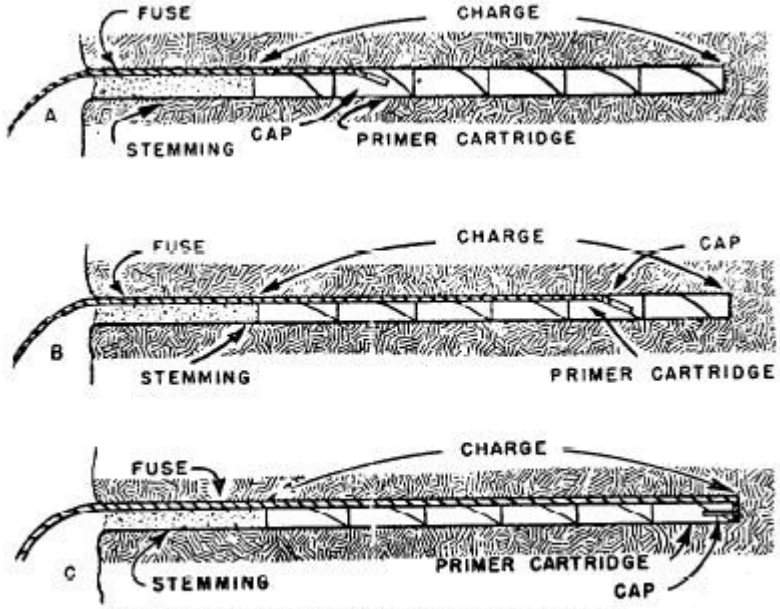

Fig 4 PRIMING OF DYNAMITE CHARGES
FIRED WITH CAPS AND SAFETY FUSES

In Fig 4, Method A is for single shots;
Method B is for multiple shots or rotation
firing in wet holes; and Method C for multiple
shots or rotation firing in dry holes or
for wet holes providing plastic covered fuse
is used

In Fig 5, Method A is for firing with in- ?
stantaneous electric blasting caps; and Method
B is for instantaneous firing and for
all rotation firing with delay electric blasting caps

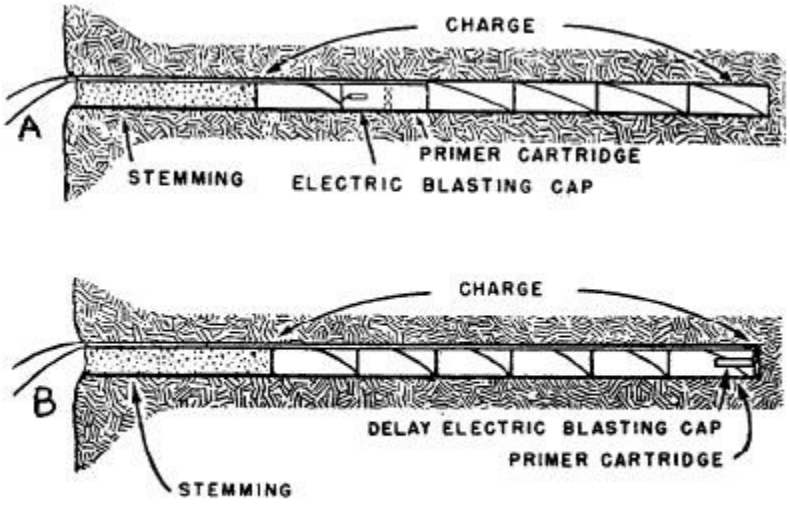

Fig 5 PRIMING OF DYNAMITE CHARGES FIRED WITH ELECTRIC BLASTING CAPS

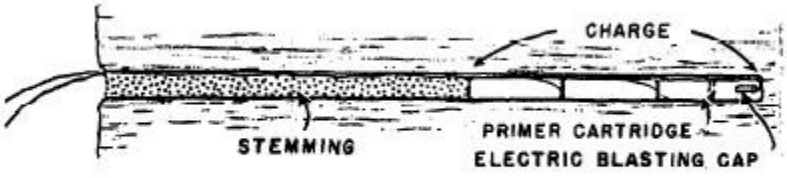

Fig 6 INDIRECT PRIMING OF PERMISSIBLE EXPLOSIVES

In Fig 6 is shown indirect priming method
recommended in blasting permissible
dynamite
Indirect Priming of the chge means the
placement of the cap in the 1st cartridge
going into the borehole with the business
end pointing toward the collar. In contrast
to this, direct priming is where the cap is
placed in the last cartridge going into the
hole and pointed toward the bottom. Indirect
priming is safer than direct priming for
the reasons listed in Ref 50, p 204

Section 1, Part C
Nonmilitary Detonators

Detonators, used for nonmilitary purposes

are commonly known in US as blasting caps
and they are described in Ref 44, pp B185 to
B201, where also numerous references are
given. In some US Bureau of Mines publications
they are called ""detonators"1 For
example, Grant & Coates (Ref 7a, p 2) stated
that ""Detonators are used to explode permissible
explosives, dynamites, or other high
explosives. This explosion or detonation
is brought about by the energy which is liberatsd
as a combination of concussion and heat
when the detonator is fired ""
The blasting caps are subdivided into
nonelectric caps, which can be single-component
and compound caps, also called "" two-part detonators
"'(Ref 44, pp B185 to B186-R); electric
caps, which can be high tension, low tension
and match-head type (Ref 44, pp B 186-R
to B188-L); and delay electric cap (p BIWI-L)
There are also a special blasting cap, suitable
for seismographic explorations and US Army
special blast ing caps, nonelectric and electric
(Ref 44, p B 188-R). ""Western Big Inch Blasting
Caps ""are briefly described in Ref 44, p B186-R
In Gt Britain devices corresponding to US
blasting caps are called commercial detonators,
Originally devices corresponding to US nonelectric
caps, known in Gt Britain as plain
detonators, contained a single expl chge consisting
of a mixture of 80% MF & 20% K chlorate.
There was a series of ten detonators and the
wt of MF mixt in the No 6 detonator was lg.
Later a switch was made to the (Azide-Styphnate-
Aluminum) ASA/Tetryl detonator (Ref 43,
p A493-R) and only No 6,& No 8 detonators
continued to be manufd. For example the NO 8,
manufd by the Nobel Society, contained O. 35g
of LA-LSt mixture and 0..55g of Tetryl (Ref 29a,
p 77). The most recent change has been the
substitution of PETN for Tetryl, which gave
AS A/PETN detonator (Ref 43, p A493-R)
(See also Ref 36, p 54 and Ref 38, p 52-3).
Although each of these detonators contain two
charges: priming or upper (ASA) and secondary
or base (Tetryl or PETN), they are still
called in Gt Brit the "" plain detonators': Corresponding
devices are known in US as compound
blasting caps (See Ref 44, p 186-L and Fig),
but the ASA detonators have no. '"reinforcing
cup ", as do the US caps
German detonators known at the time of
WWII are described in Ref 35, pp Ger 34 &
Ger 35. The Briska detonator which originated
in Germany before WWII is described by
Stettbacher (Ref 3, p 348) and in Ref 35, p
Ger 23. In the Briska version of detonator

manufd in Gt Britain, the priming charge is LA/LSt mixture, while the secondary (base) charge is loaded in two stages: the 1st at a very high pressure (28400psi) and the 2nd or ""intermediate "" chge at the lower pressure of 400psi. The highly compressed portion is difficult to ini~a te and the low compressed portion acts as a booster to ensure detonation. The No 6 Briska is more powerful than No 8 ASA detonator (Ref 22a, p 11). Simi lar description is given in Ref 38, p 35
In the book of Fordham (Ref 51, p HM-09) are described Brit ""plain detonators": such as No 6, which contains as a base chge 0.24'g PETN snd No 8 Star, which contains 0.8g PETN. As a priming charge, in both cases, a 2/1 mixt of dextrinated LA/LSt is used with ca 3% Al powder and, sometimes, 3% Tetryl added
Electric blasting caps (or electric blasting initiators) are described in Ref 44, pp B 186-R to B 186-L. Such caps are called "" electric detonators "" in Gt Britain. The type known as the "-neoprene plug assembly "j is described in Ref 36, pp 56-8 and Ref 38, pp 53-6 and is shown here in Fig 7. It consists

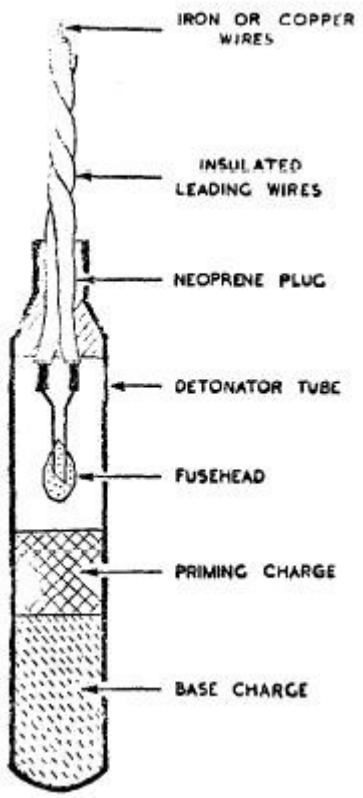

Fig 7 NEOPRENE PLUG ASSEMBLY (ELECTRIC DETONATOR)

of an Al or Cu tube contg base & priming charges, fusehead (also known as match-head), leading wires and neoprene plug. The function of the piug is to provide a completely waterproof seal at the open end of detonator
When used in permitted expls Cu tube must be used because Al might ignite and its flame will cause firedamp explosion
Low tension fusebead, described in Ref 36, p 58 and Ref 384 pp 54-5 is shown here in Fig 8.

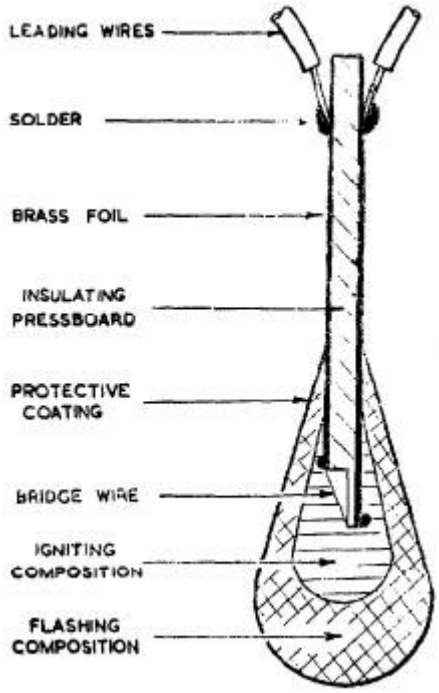

Fig 8 LOW-TENSION FUSEHEAD FOR ELECTRIC DETONATOR

It consists of two brass foils, separated by a layer of insulating pressboard. At one end the two leading wires are soldered, one to each foil, and at the other end the two foiis are connected by a very fine high resistance bridge wire. A bead of ignition composit ion is formed around the bridge. The bead is made of several layers and the innermost consists of a readily ignitable mixt of K chlorate & Pb mononitroresorc inate, with a little NC. This is then surrounded by a flashing compn, such as mixt of K chlorate & charcoal (which produces a hot and vigorous flash) and finally the bead is dipped into a protective coating . of NC soln. After drying, the fuse head and neopreiie plug are inserted thru the open end of tube and the tube is crimped as shown on Fig 7

Fordham (Ref 51, pp 116-19), calls the fusehead of Fig 8 the Sandwich type fusehead and states that it was invented by Krannichfeld in Germany. Judging by the description of its method of manuf, it is similar to German fuseheads described in Ref 35, pp Ger 53 & Ger 54

Fordham describes four types of Brit commercial electric detonators (Ref 51, p 116, Fig 10. 1). The first three types are ““low tension bridge detonators ““ and correspond to US electric blasting initiators shown in ,Fig, p B188 of Ref 44. The 4th Brie type is”hightension, requiring at least 36 volts for its initiation. There is no bridge wire but electric conductivity is achieved by incorporating graphite in the flashing compn of fusehead! . The use of this type seems to be discontinued in Gt Britain (Ref 51, pp 117-21)

British commercial electric delay detoraators are described in Ref 36, pp 69-?4; Ref 38, pp 56-9 and Ref 51, pp 125-30. The earliest type introduced in Gt Britain in 1910 had various lengths of Bickford fuse between the fusehead and the detonator proper (Fig 11.1 p 126 of Ref 5 1). An important feature was a small hole (vent) in the detonator tube, located betw the fusehead and the fuse. The hole initially covered with a tape (which broke on firing) served as a way of escape for gases formed on burning of fuse. This design was necessary to prevent an increase in pressure which could cause too rapid burning of safety fuse. As this might cause irregularity in delay time and premature ignition or expln of main chge, this type of detonator was in many cases replaced by the type of detonator invented by Eschbacb. In this new detonator the delay compn (such as a mixt of K permanganate 55-7o & Sb 45-30%), which is used in lieu of safety fuse, evolves so little gas that there is no necessity for a vent. This detonator eliminates the risk of premature expln and makes it possible to provide fully waterproofed assemblies which give delay times much more regular. Such ““gasless ““ delay detonators are usually manufd in series to fire at prearranged delay times with intervals of time 1 or 0.5 sees betw the numbers. The so-called millisecond or short delay detonators are manufd with intervals betw each number of the series varying betw 25 and 50 miHiseconds (Ref 51, pp 125-27)

Two types of British ““electric delay detonators ““: the “’early vented type ““ and

the ""modern unvented type "" are- shown in Fig 9 (Ref 51, p 126)

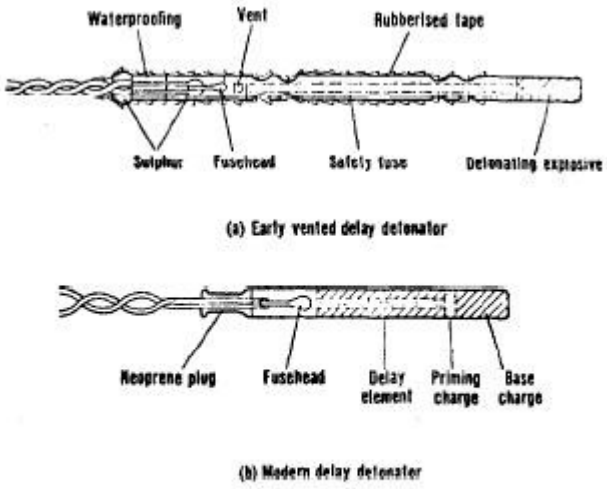

Fig 9 TWO TYPES OF BRITISH ELECTRIC DELAY DETONATORS

A type of British ""electric delay detonator with an intermediate charge "" is described in Ref 36, p 70 and is shown here as Fig 10.

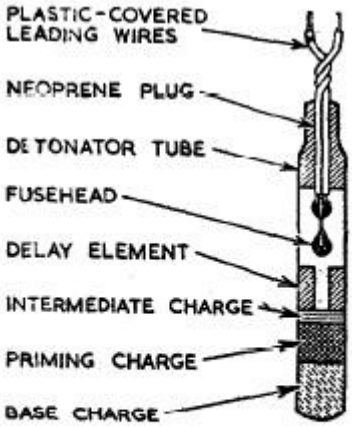

Fig 10 BRITISH ELECTRIC DELAY DETONATOR WITH AN INTERMEDIATE CHARGE

it consists of a thin-walled metal tube closed at one end and loaded with base chge, priming chge, intermediate chge, a delay element (which consistsof athick metal tube loaded by compression with a slow-burning compn), a fusehead and neoprene plug. When the fusehead is fired by electrical current, it ignites

the delay compn and this initiates the intermediate, priming and base chges. Both the fusehead and the delay compn are practically ""gasless"1 ,This is achieved by using mixts which produce on combustion no gases but solid metallic oxides. The fusehead consists of a mixt of rare-earth metals & metallic peroxide, while delay compn is a mist of Sb powder & K permanganate (Ref 36, p 70)
An other type of British nonmilitary electric detonator, called "" short type delay detonator "" is described in Ref 36, pp 72-3 and is shown here in Fig 11. This detonator con-

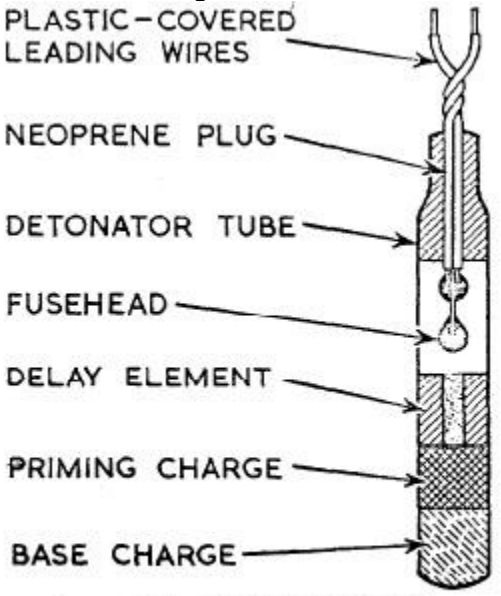

Fig 11 BRITISH ELECTRIC SHORT DELAY DETONATOR

sists of a copper tube closed at one end and filled with charge for No 6 strength mixture. Its base chge comprised of Tetryl or PETN and the priming chge is a mixt of LSt/LA/Al powder & binding agent consolidated together by pressure. Above these comes the delay element consisting of a thick brass tube loaded in pressed increments with a granulated mixt of red lead and silicon (or with some other mixt). Ignition is achieved by a ""gasless "" type of low-tension fusehead (such as a mixt of rare earth metals and metallic peroxide). The closure is effected by the neoprene plug seal which has been found very satisfactory for the standard gasless delay detonators. With this type of closure it is practically impossible to pull out the leading wires or disturb the internal part of the detonator by any pull which can be brought to bear on the wires (Ref 36, pp 71-3)

Ordinary delay detonators in Gt Britain are issued in series numbered from O to 10, the interval betw any two consecutive delay numbers being 0.5 sec. Thus the NO O fires instantaneously, No 1 fires 0.5 sec later, etc (Ref 36, p 71)

Short delay detonators standardized in Gt Brit in 1956 number 15 and their periods run from O for No O to 700 milliseconds for No 15. For No 1 it is 25 msec, for No 2-50, for NO 4-100, for No 10-345, etc (Ref 36, p 73 and Table 2, p 74)

Firing characteristics of Brit electrical detonators are given in Ref 51, p 121

Devices similar to above electric delay detonators are described in Ref 44, p B 188-L, under BLASTING CAPS and in Ref 48, pp D49-R & D50-L, under Delay Blasting Cap. The description includes two types of electric delay caps of DuPont Co and a nonelectric de lay blasting cap (pB50-L]. Compositional of various delay elements are given on p B52

Fordham (Ref 51, p 127) states that a common mixture for US delay elements consists of Ba peroxide 85 & Se 15% and that for the manuf of millisecond delay detonators, faster burning compns are required such as Si 30-50 & red lead (or lead dioxide) 50-70%. Manuf of delay compns is described on pp 128-29, assembly on p 129 and design on pp 129-30 of Ref 51. Ger delay compositions (Verzb”-gerungsverbindungen) and delay elements(Verz& gerungski5rper) are described in Ref 35, pp Ger 33 & Ger 34

Taylor & Gay (Ref 36, pp 62-4), discuss ““principles of series ““ shot firing “t where they explain why the current needed to fire a series should be greater than that required to fire a single e lectric detonator. If a uniform direct current is applied to a series of electric detonators, before any one detonator can fire, the fusehead must be traversed by the current for a certain period of time (usually of the order of milliseconds) during which time the bridgewire heats up to a temperature at which the sensitive compn of the fusehead ignites and fires the detonator. The minimum time is called the “’excitation time ““ and this is shown in Ref 36, p 63, as Fig 10, which is given here as Fig 12. After the fusehead receives the minimum amt of current there will normally be a further small time lapse before the ignition spreads thru the fusehead and communicates to the priming charge of detonator. This is the moment at which it

is considered that the electric circuit of detonator is broken. The time from the first applicariOn of current to the rupture of the circuit is referred to as the ““lag time ““ and the time between the first application of the current and the detonator firing, is called the ‘“bursting time”~ The difference betw the lag time and the bursting time is referred to as the ““ induction time ‘“

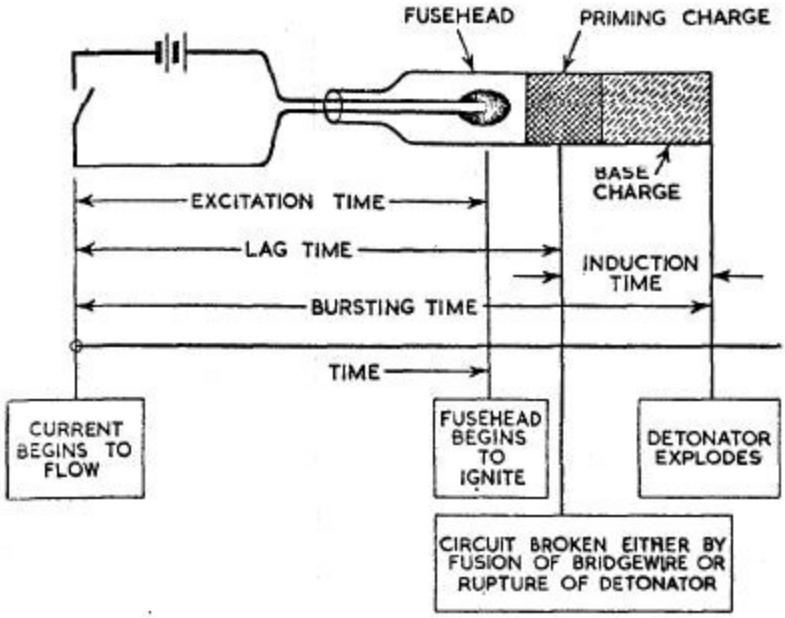

Fig 12 THE SEQUENCE OF EVENTS IN FIRING ELECTRIC DETONATORS

For firing successfully a series of detonators it is required that the shortest ““lag time ““ of any of them must exceed the longest ““excitation time ““of any of them. In other words, every one of the detonators must receive the full quota of electric energy to cause its ignition before any single one of them has completed its ““ lag time ““
The firing characteristics of commercial electric detonators are shown in Ref 36, p 64, Fig 11, given here as Fig 13. The curve APB of Fig shows the relation between current i and ““minimum lag time ““ for the most rapid detonator in the series, while the curve CPD shows the corresponding relation between current and ““maximum excitation time ‘“ for the least sensitive detonator of the series. From the curve it can be seen that with current ~1, the most rapid detonator will break the circuit in T4 milliseconds, whereas the least sensitive detonator requires at least T5 millisecs of current flow to enable it to fire, At a higher

current i2, however, the excitation time T, is less than time T2 which is allowed by the most rapid detonator, and hence the least sensitive detonator in the circuit will have ample time to receive its full quota of current before the circuit is broken at T2. Somewhere between the two current values [1 and ;2 , corresponding to the crossover point P j there must be value ;O which will be minimum firing current of a single electric detonator of the same type, and this is the reason why series firing requires a higher current than simple firing

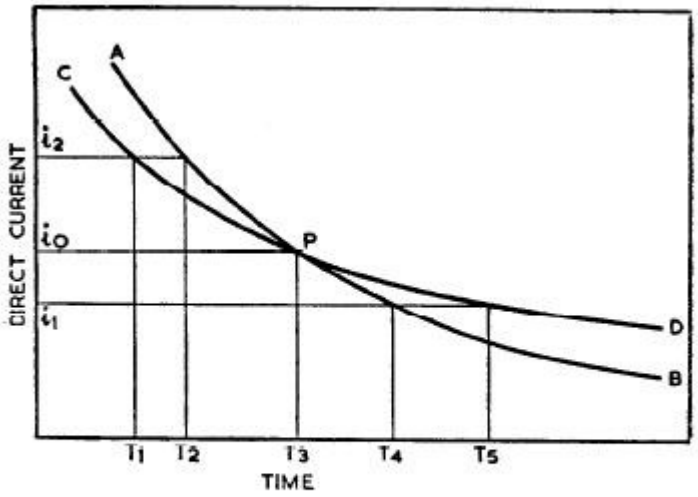

Fig 13 THEORY OF SERIES FIRING WITH TWO TYPES OF ELECTRIC DETONATORS

Section 2
DETONATORS, IGNITERS, PRIMERS AND OTHER INITIATING DEVICES USED FOR MILITARY PURPOSES

Before proceeding with the description of these devices, there is given a GI ossary of Ordnance and other terms which will be used in the text of this section. It is done in order to make the subject of initiating devices more comprehensive. If an item mentioned in the Glossary is already described in one of the volumes of this Encyclopedia (listed here as Ref 43 for Vol 1, Ref 44 for Vol 2 and Ref 48 for Vol 3), only its cross-reference is given

At the end of Glossary is given as Part B, the Nomenclature Used by US Armed Forces and in Part C the History of Development of Initiating Devices

Section 2, Part A
Glossary of Ordnance and Other Terms Used in This Description of Ordnance Items

Activator (of a Land Mine). It was defined in Vol 1, p A lO 1-L of Encycl (Ref 42) as a fuze, but actually it is a detonator-booster, which acts in conjunction with a firing device, as a secondary /uze which provides some A/T mines with antilifting or booby trapping capabilities. In TM 9-1940 (1956), "Land Mines", pp 110-11 is described Activator .M1 which is used in A/T mines M6 & M15 series. The device is ca 2 inches long and is made of a black plastic material. It contains a detonator, has a cylindrical unthreaded cup cemented to the opposite end of the body and contains a TetrYl booster chge (See Fig 14). There is also Activator HE, M2 (RDX-loaded) (Compare with Fuze, Auxiliary, under Fuzes in Section 5, Part A)

Activator, Antitank Mine . It is defined in MIL-STD-444 (Ref 40a, p 2) as ""a nonmetallic item designed to adapt a firing device to an antitank mine. It may be empty, inert filled or explosive filled '"

Actuator. See Explosive Actuator in this Glossary

Aircraft Ammunition. See Ref 43, p A384-R

Ammunition. See Ref 43, p A383-L & Ref 40a, p8

AP . Abbr for Armor-piercing

A/P Abbr for Antipersonnel

AT or A/T . Abbrs for Antitank

Auxiliary Detonator, See Detonator, Auxiliary

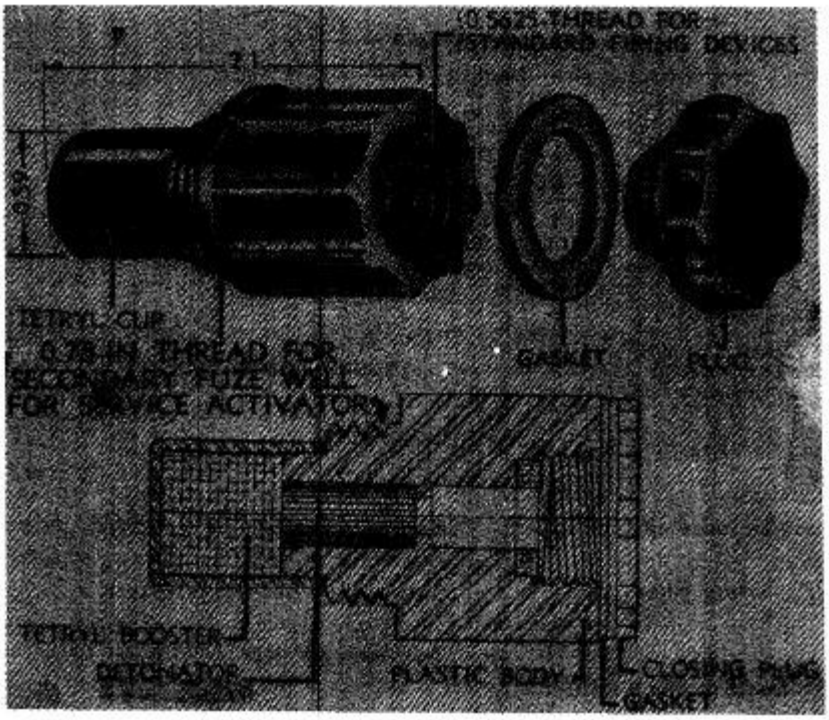

Fig 14 ACTIVATOR M1

Baffle (Used in Delay Elements). When a primer of a delay element is initiated, a high velocity jet (hot gases, slag particles, and fragments of the closure disk or cup) is projected toward the BkPdr pellet. The inertia of these blast components is such as to cause undue penetration of the pellet's surface thereby disrupting a portion of it and affecting the delay time. Such condition is exceptionally serious with obturated delays of small time magnitude, say 0.01 see, where the impingement of these combustion products will completely ‘d;srupt the very small pellet, givkg no significant delay. To combat this disruptive force, a ba//~e is employed. Baffles' have many forms, but all serve to absorb the energy of slag particles and sealing device fragments by deflecting them. An additional function is to reduce the velocity of the hot primer gases and ““ease ““ them across the surface of the pellet. Baffles ate made of the same material as delay element body in order to reduce the possibility of electrolytic corrosion. Brass or Al alloys are usually employed, and occasionally stainless steel. The size of the baffle is usually dictated by space

limitations, but it must be large enough to provide channels of sufficient size to prevent excessive back pressure on the primer cup, which may cause rupture. Channels may be large enough to prevent primer cup failure, but small enough to provide proper ignition of the pellet (Ref 23, pp 5-29 & 5-30). TWO types of baffles are shown in Fig 5-26 (See also Section 4, Part F, Delays, Relays and Leads, etc)
In the event that a short delay is des;.red but space limitations preclude the incorporation of any baffle, the BkPdr pellet should be pressed very strongly to offer resistance to penetration by the high velocity particles

Ballistic Missile. See Ref 44, p B6-L & Ref 40a, p 8

Ballistite. See Ref 44, p B8-L

Base Charge in Detonators, also known as main charge, is defined in the text under Detonators, etc

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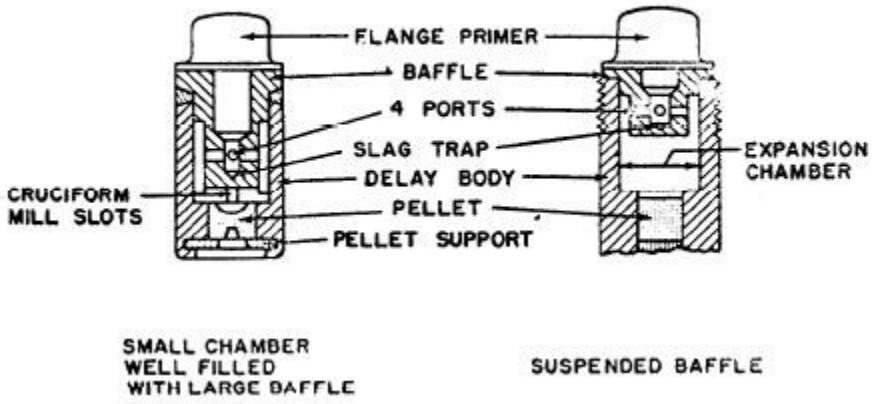

Fig 15 TWO TYPES OF BAFFLES

BD Fuze, Abbr for Base-Detonating Fuze

Bickford Fuse or Miner' s Safety Fuse. See Ref 44, p B112-L

BkPdr (Black Powder). See Ref44, pB165-R

Blasting Cap. See Ref 44, pB185-L&Ref @a, p 24

Blasting Machine (Exploder). See Ref44, p B212-L

Blend. Nitrocellulose (NC) contg 13.15 to 13.25% N. See Ref 44, p C103-L

Bomb. See VOI 2 of Encycl (Ref 44), p B225-Rff

Booby Trap. See Ref 44, p B225-R

Boom. An extension of an ordnance item

Boom Igniter. Such igniters are shown on cutaway illustrations of 90mm HEAT Cartridge M348Al and 105mm HEAT Cartridge M341 described in Section 3, Subsection D, under Primers and also in Ref 52, p 3-26. The Figs show that percussion primers of these cartridges are threaded into the fin assembly of the tail boom. A recess holds the 1 st ignition cartridge. Then comes a vent for the transmission of the cartridge gas to the "" boom ignition cartridge "1 This extra cartridge is needed for proper de flagration of propellent charge (Ref 55)

Booster. See Ref 44, p B243

Bullet. See Ref 44, p B324-R

Burster. See Ref 44, p B364-L

Bursting Charge or Main Charge. See Ref 44, p B364

Cannon. See Ref 44, p C26-L and Ref 40a, p 23. The following slightly different definition is given in Ref 45f, p 2-1: ""A cannon (general) is a weapon conforming to the general gun definition, that is provided with structure (mount) for mechanical support during firing, and that has a bore diameter exceeding the limit assigned to small arms. (The small arms bore limit is presently administratively set at 3i)mm). The general category of cannon is further divided, in accordance with ballistic characteristics and use, into guns, howitzers, mortars, and recoilless weapons "1 A "" cannon "" (specific), is defined in Ref 45f, p 2-5, as the term used to denote the " shooting part of a complete weapon (gun , howitzer, mortar or recoilless weapon) comprising only the tube and breech structures and such mechanism as is supported thereon for opening and closing the breech and firing the propelling charge

Cannon Propellant. See Ref 44, p C29-R

Carbine. See Ref 44, p C51-L & Ref 43, p 4-6

Cartridge. See Ref 44, p C70

Charge (Explosive Charge). See Ref 44, p C150

Cluster. See Vol 3 of Encycl, p C351-L

Collodion Cotton (abbr CC). See Ref 44, p C103, under CELLULOSE NITRATES. Also known as Pyroxylin

Complete Round of Ammunition. See Ammunition, Complete Round in Ref 43, p A385-L

Composite propellants . See Ref 48, p C464-L

Cord, Detonating or Cardeau. See Ref 44, p C529-R

Cordite . See Ref 48, p C531-R

Cyclonite. See RDX in this Glossary

DADNPh . Our abbr for Diazodinitrophenol

DDNP. Abbr given in TM's for Diazodinitrophenol

Deflagrating Explosives. See Ref 48, pp D38.R and D107-L. Known also as Low Explosives (See in this Glossary)

Deflagration. See Ref 48, p D38-R

DEGDN.. Our abbr for Diethyleneglycol Dinitrate

Delay. See Ref 48, p D49 and in this Vol, Section 4, Part F

Delay Blasting Cap. See Ref 48, p D49-R

Delay Charges; Delay Compositions or Deloy Powders . See Ref ,48, p D50-Lff and Section 4, Part F in this Vol

Delay Detonators . See in this Vol, Section 4, Part F

Delay Explosive Train. See in Ref 48, p D53.L and in this Vol, Section 4, Part F

Demolition Bangalore Torpedoes. See Ref 44, p B16.R

Demolition Explosives. See Ref 48, p D56.R & Ref 53

Demolition Kit or Unit. See Ref 48, p D61-L

Demolition Snakes. See Ref 44, p B17

Destructor. See Ref 48, p D92-R

Detonating Cap. Same as Blasting Cap

Detonating Cord . See Cord, Detonating in Ref 48, p C529-R and Detonating Cord or Fuse in Ref 48, p DI03

Detonating Explosive. See Ref 48, p DI07-L and also High-Explosive in this Glossary

Detonation. See in this Vol under DETONATION (AND EXPLOSION)

Detonator (Commercial or Nonmilitary); See Section 1, Part C in this Vol

Detonator, Auxiliary. The following explanation is given by odierno in Ref 45d, p II:
"- In the development of some items in the past, prior to the use of electrical fuzes for PIBD (point initiated base detonated) fuzes, an explosive component known as an auxiliary detonator was used. This detonator resembled flanged lead cup in outward appearance, however, it was longer, larger in diameter and incorporated a shape charge on the output end. The auxiliary detonator was used to jump the gap from the base of the fuze down through a hollow tube in the shell to a Tetryl or RDX pellet in the bottom of the shell. This was acceptable, however, it was not as efficient as the electrical PIBD F uze, because of alignment problems, time of functioning, etc ""

Detonator, Delay. See in this Vol, Section 4, Part F

Detonator, Electric . See Section 3, Part E and Section 4, Part D

Detonator, Flash. See Section 3, Part E and Section 4, Part D

Detonator-Primer. See Section 3, Parts D & E and in Section 4, Parts D & E