

# CATALOG OF GERMAN ORDNANCE AND EQUIPMENT

**Mines**  
**Grenades**  
**Ammunition**



*Aberdeen Proving Ground*

MARYLAND

## IGNITERS

GERMAN

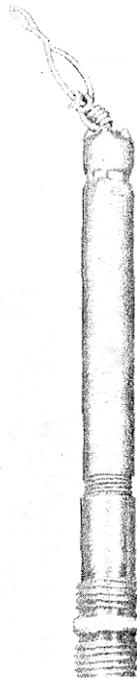
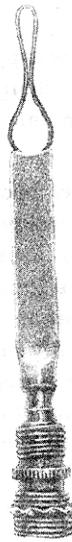


Practically all German mines, including antitank and antipersonnel mines and booby traps, are fired by one or more of several standard igniters. Mines and prepared charges have one or more holes drilled and threaded to receive these igniters. Hand Grenades also employ igniters of the friction, pull, and pressure types. These specialized firing devices are divided by structure and function into friction, pull, and pressure igniters, and a miscellaneous group including such special devices as the tilt, rupture, chemical, and time delay types. A number of the styles most commonly employed by the German army are pictured on the following pages; a few examples are described as representative of each group.

## Friction Igniters



B.Z. 24

B.Z. 39  
Mod.NB.B.Z.  
38

B.Z. 39



B.Z. Exp.

B.Z. 4.5  
Sec.Feld  
Schlag-  
Rohr

## IGNITERS

GERMAN 

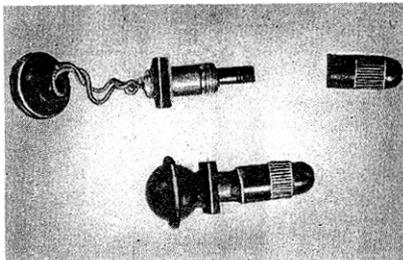
## Friction Igniters

Zdschn. Anz.  
29Zdschn. Anz.  
39Reiss-  
zunderReibzunder  
West

N.B.Z. 29

French  
Friction  
Igniter

## Friction Igniter B.Z.E. (Brenzunder Ei)

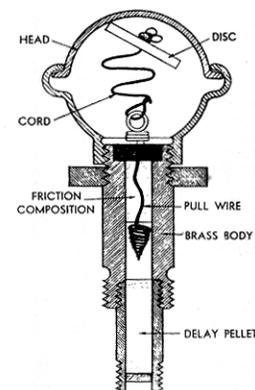


This igniter, which is used in the German egg grenades, resembles the Zdschn. Anz. 39. The B.Z.E. type has different colored caps indicating various lengths of delay in the delay pellets. Red indicates 1 second delay, blue, 4.5 seconds; yellow, 7 seconds; and white, 10 seconds. The blue-capped igniters are used in the

egg grenades, and the yellow-capped with prepared or hollow charges. Red and white-capped igniters are seldom used.

The Germans have at times booby-trapped these igniters by removing the delay pellet, which is usually screwed into the base of the igniter, and by replacing the igniter in the grenade. The igniters normally fitted with delays have right-hand threads on the caps which differentiate them at night from the left-hand threaded, grey-capped fuze igniter, Zdschn. Anz. 39.

In order to operate the device, the cap is unscrewed and the string given a sharp jerk, pulling the wire through the friction composition.

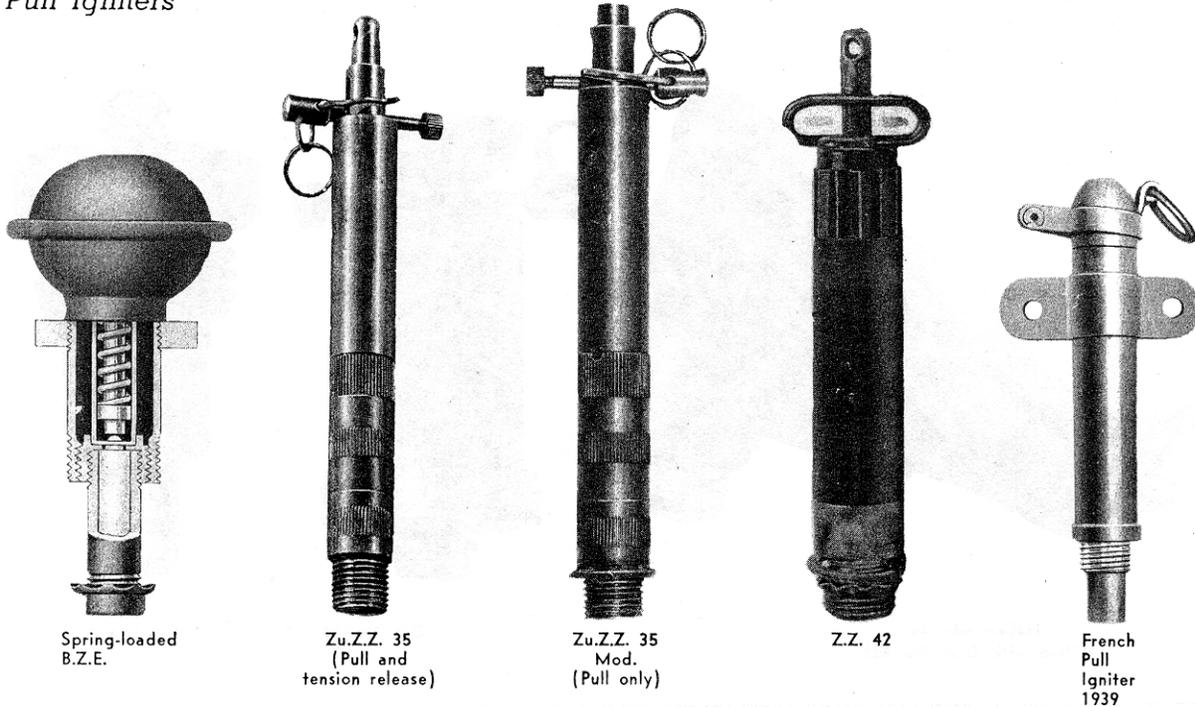


## IGNITERS

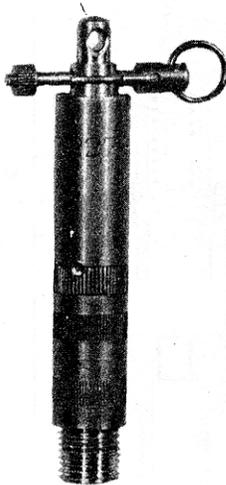
GERMAN



## Pull Igniters

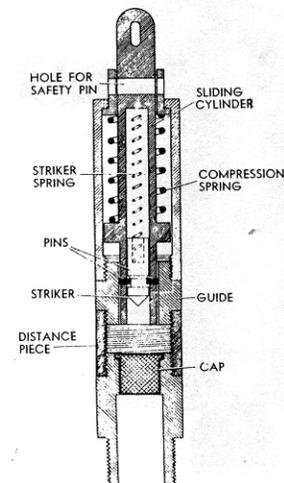


## Pull Igniter Z.Z. 35 (Zugzünder 35)

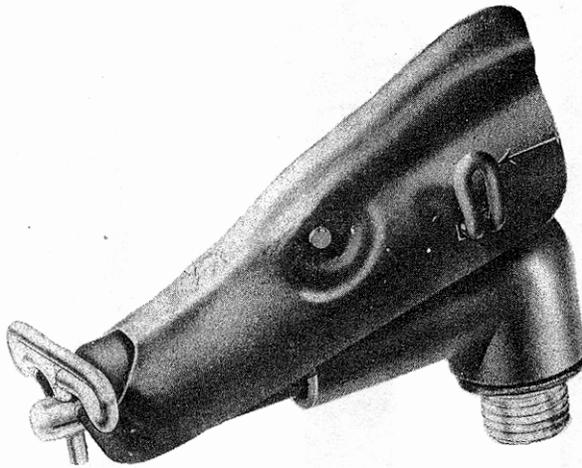


This brass igniter is used with the stock mine and occasionally with the "S" mine. It is also commonly used with booby traps.

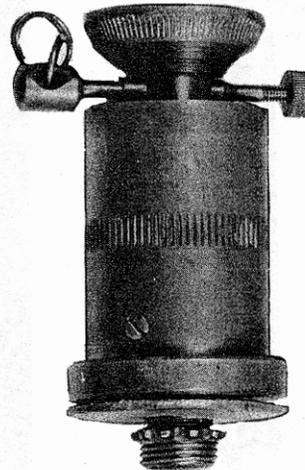
The igniter is provided with a safety pin which is inserted through the inner of the two holes in the end of the spring-loaded striker. A trip wire is attached to the outer hole at the end of the striker. In normal use, it is screwed into one of the anti-lifting wells of a mine, a trip wire is attached, and the safety pin is withdrawn.



## IGNITERS

GERMAN *Pressure Igniters*

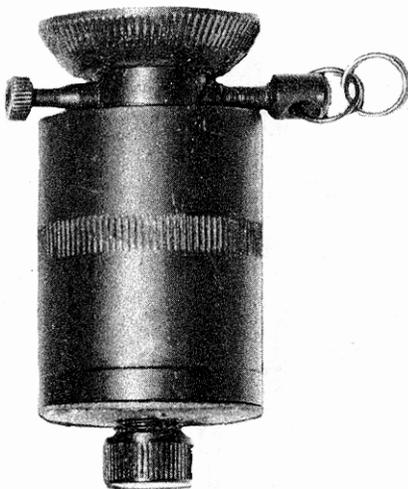
Hebelzündler 44  
(Used with Glasmine 43)



D.Z. 35 (B)

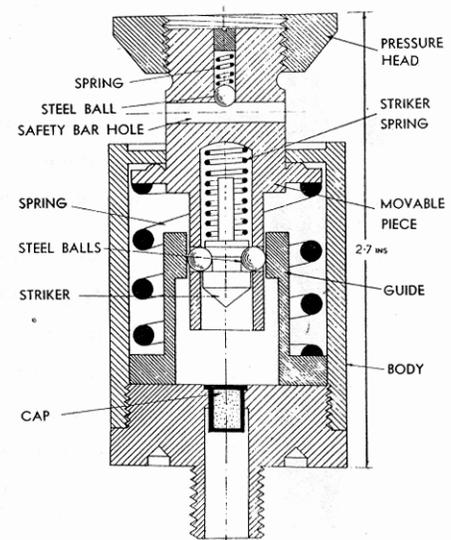


French A.T.

*Pressure Igniter D. Z. 35 "A"*

This igniter is designed for use with improvised mines and booby traps. The igniter consists of a white metal body housing the ball-release, spring-loaded striker assembly. The igniter is provided with a safety pin through the head of the plunger.

To operate, after withdrawal of the safety pin, the igniter is fired by pressure on the pressure piece which depresses the plunger until the steel balls are free to escape into the recess in the guide. The spring-loaded striker is released against the percussion cap. A pressure of 130-160 pounds is necessary to fire the igniter.



## IGNITERS

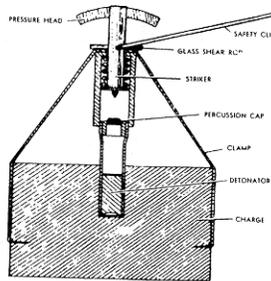
GERMAN



## Pressure Igniters



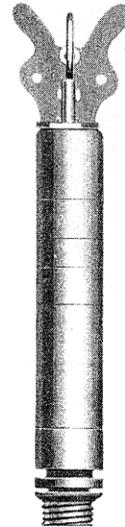
530 (e)



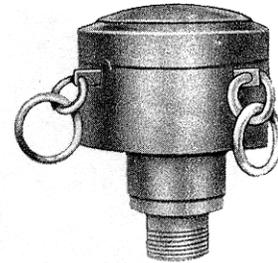
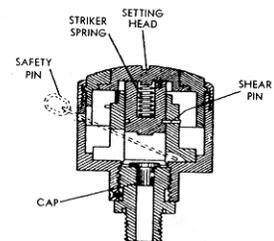
Weissmann



P.X. 38

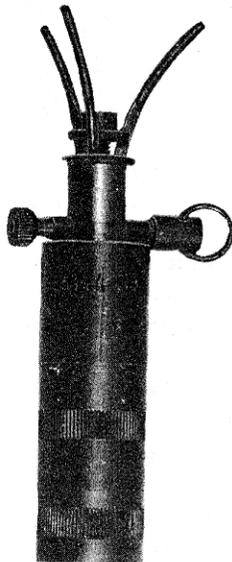


S.Mi.Z. 44

Z. D. Z. 29  
(Push or Pull Type used  
with T. Mi. 29.)

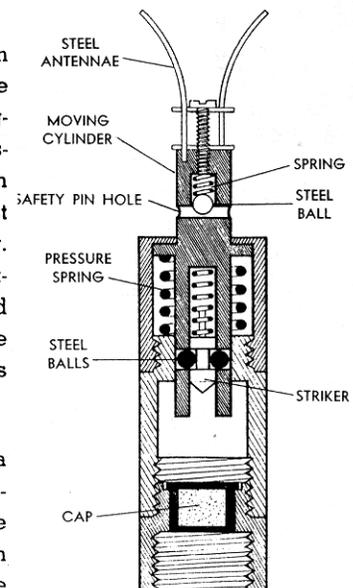
Z. D. Z. 29

## Pressure Igniter S. Mi. Z. 35



This is the standard igniter used in the "S" mine. It consists of a white metal body, housing the spring-loaded, ball-release type striker assembly. The igniter is provided with a safety pin through the plunger just above the top of the igniter body. There are three pressure prongs attached to the top of the plunger and held in place by a screw. The mine is usually buried with just the prongs of the igniter above the ground.

When the safety pin is removed, a pressure of 15 or 20 pounds is necessary to depress the plunger until the striker retaining balls are freed in the lower recess, releasing the striker.



## IGNITERS

GERMAN

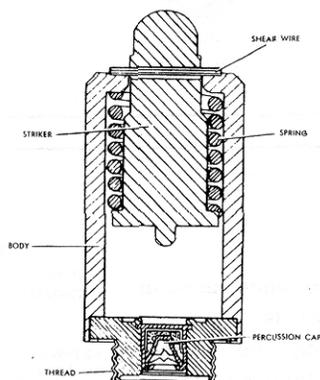
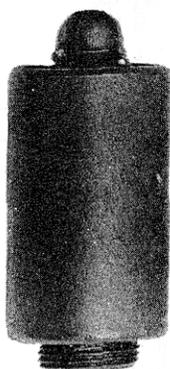


Pressure Igniter T. Mi. Z. 35



This metal igniter is used with the Tellermine 35 and 35 (steel). On the top of the igniter is a setting screw with a red dot which may be turned to coincide with a white groove marked "sicher" (safe), or to a red groove marked "scharf" (armed). This screw is connected to an arming spindle inside the igniter. When set at "scharf," a flange is turned out of the striker recess putting all the strain of the spring-loaded striker on the small shear wire holding the striker to the striker guide. There is a safety bolt which, in the safe position, passes through a hole in the top of the striker.

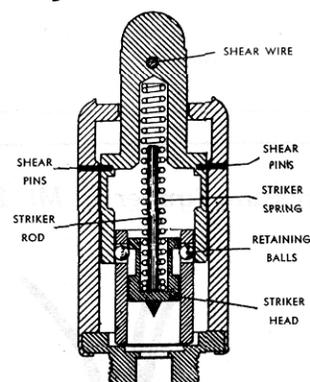
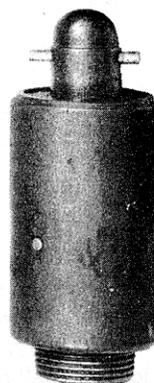
Pressure Igniter T. Mi. Z. 42



This igniter, used in the Tellermine 35 (steel), 42, and 43, consists of a cylindrical, steel-shelled body housing a simple steel striker retained against the pressure of a steel spring by a thick shear wire which passes through a hole in the top of the striker, the ends resting on the top of the igniter body. There is no safety pin. This igniter is sometimes manufactured with the detonator attached.

In operation, pressure on the mine cover presses against the striker head, shearing the wire and releasing the striker.

Pressure Igniter T. Mi. Z. 43



Externally this igniter resembles the T. Mi. Z. 42, but the head (actually a sleeve) is a little longer, and the shear wire is located a quarter inch above the igniter body. Once installed, this igniter cannot be disarmed. When the cover of the Tellermine is screwed down, the sleeve shears the two brass pins holding it to the body. Further pressure forces the sleeve down until the two steel balls escape into the upper recess and release the striker. If an attempt is made to unscrew the mine cover, the sleeve rises, letting the balls escape into the lower recess, releasing the striker.

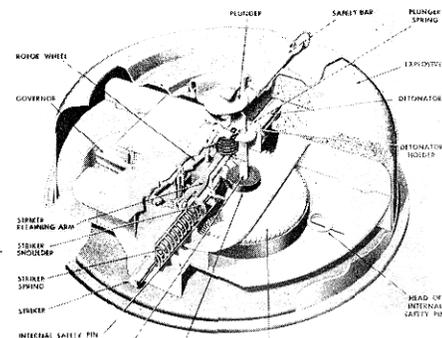
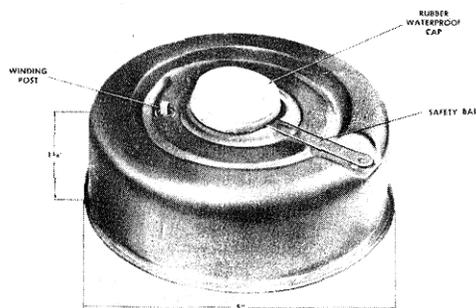
## IGNITERS

GERMAN

*Pressure Release Device E.Z. 44*

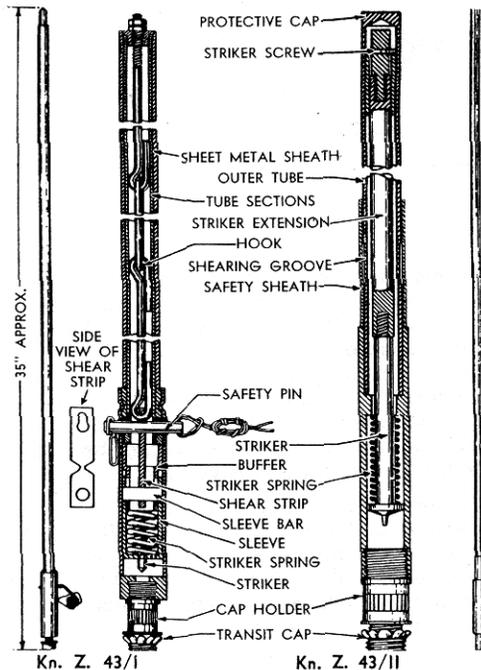
This device consists of a thin-shelled, round steel body, 5 inches in diameter and 1.75 inches high, housing a simple clockwork mechanism and a one-half pound charge. It is designed to be laid under mines, but may also be used as a booby trap.

On the top is a small pressure plate connected to a hinged arm holding the spring-loaded striker back. A safety bar runs through the pressure piece into one of the clockwork wheels, preventing the wheel from turning. The mechanism is wound up with a special key and a weight of at least 10 pounds placed on



the pressure piece; then the safety bar is pulled out starting the clockwork. As the mainspring unwinds, it pushes the safety pin from the hole in the striker. The mine is then armed and the only thing holding the striker back is the hinged arm held down by the pressure piece against a compressed spring. When the weight is lifted from the pressure piece, the hinged arm moves up, freeing the striker.

Once this device is armed under an object, it cannot be disarmed or neutralized.

*Rupture Igniters 43/I and 43/II*

Each of these igniters is approximately 35 inches in length including the elongated staff. Either type is screwed vertically into any standard igniter socket and is designed to initiate the mine when tilted.

Kn. Z. 43/I has a staff made up of 5 sections containing a chain of hooks, the bottom one engaging the shear strip in the igniter. Sideways pressure on the staff causes the hooks to pull the shear strip upwards, raising the sleeve bar, sleeve, and spring, rupturing the shear strip and releasing the spring-loaded striker.

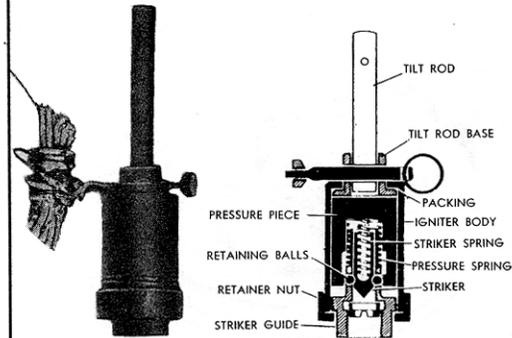
Kn. Z. 43/II is featured by a striker extension made of brittle plastic enclosed in an outer tube with a shear groove towards its lower end. Sideways pressure breaks the outer tube at the shearing groove and breaks the striker extension, releasing the spring-loaded striker.

## IGNITERS

GERMAN



## Tilt Igniters 43A and 43B

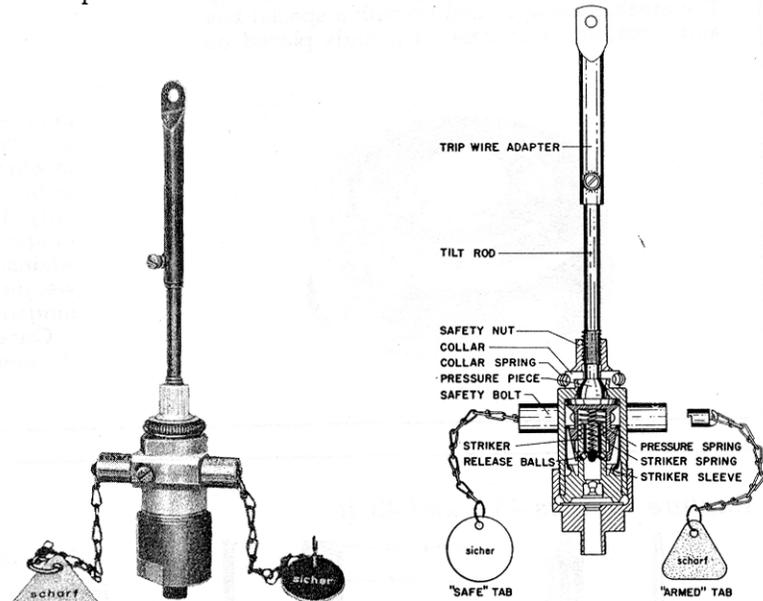


Kippzunder 43 (A)

This igniter, designed to fire when the tilt rod is pushed or tilted in any direction, has standard German threads, permitting its use in any igniter well. It has been found screwed into the bottom well of Tellermines laid upside-down and buried in the ground, the tilt rod extension extending into the air about two feet.

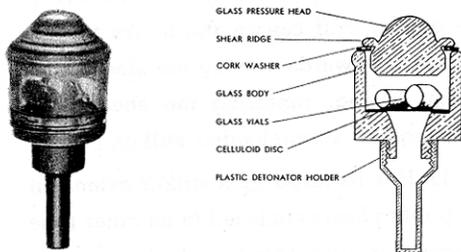
The igniter is armed by removing the safety pin. When the tilt rod is moved, the base rod tilts inside the igniter body, depressing the pressure piece and pressure spring, allowing the retaining balls to escape into the recess which releases the spring-loaded striker. A pressure of 15 or 20 pounds will set off the igniter.

Igniter 43B is similar to the preceding except for the method of arming and the safety device. A safety bolt runs horizontally through the igniter body. At each end of the bolt is a detachable chain with a metal tag on the end. One tag is round, marked "sicher" (safe); the other is triangular, marked "scharf" (armed). When the igniter is armed, the "scharf" chain is pulled out. This positions the bolt in such a manner that the pressure piece will be depressed when the rod is tilted. The igniter may have a trip wire attached to the tilt rod or it may be provided with the two-foot extension rod.



Kippzunder 43 (B)

## Topf Mine Chemical Igniter

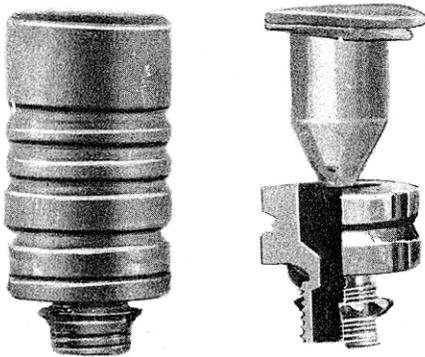


This chemical igniter, used in the Topfmine, is an entirely non-metallic pressure type without a safety device. It consists of a hemispherical pressure head fitted into a hollow glass body. The body screws into a plastic detonator holder. Two glass vials, one containing sodium and potassium as a liquid alloy and the other ethyl nitrate, are fastened within the body to a celluloid disc by adhesive tape.

When the pressure plate of the mine is sheared under a load of about 330 pounds, the head of the igniter shears along its ridge and crushes the glass vials. The resulting chemical reaction causes a flash which sets off the detonator.

## IGNITERS

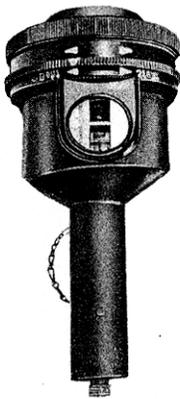
GERMAN

*Buck Chemical Igniter*

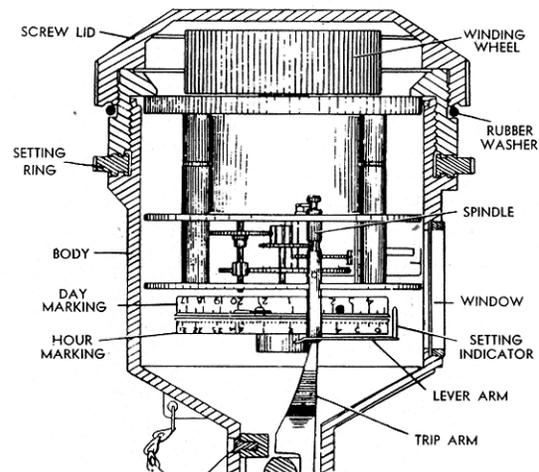
The Buck Chemical Igniter consists of a soft metal shell containing a glass vial of sulphuric acid surrounded by a white, sugar-like powder containing potassium chlorate. The base of the

igniter is threaded to fit in the activating well of any German mine with a standard thread. In operation, when the soft metal shell is crushed, the glass vial breaks, and the acid coming in contact with the powder produces a chemical reaction which ignites the mixture, sending a flame down to the detonator. There is no safety.

A newer version of this igniter differs from the old type in that it is shorter and contains a glass vial of purple chemical instead of sulphuric acid.

*21-Day Clockwork Igniter J. Feder 504*

This igniter, which can be set to go off at any time up to 21 days, is accurate to within 5 minutes in the maximum time limit. It is housed in a white metal case, threaded to take a lid. The mechanism is set by means of a wheel under the lid. Two metal rings are visible through a glass window in the side of the igniter. One wheel, numbered in red, indicates the number of days desired to elapse before the striker is released; the other, numbered in black, is for the hours. The setting ring, marked "Steht" (stop) and "Geht" (go) is located just above the window. A combined safety and arming hole is in the striker "neck" just below the clockwork housing. The arming screw, marked "scharf" is attached to a chain; the safety screw marked "blind" is carried in the hole.

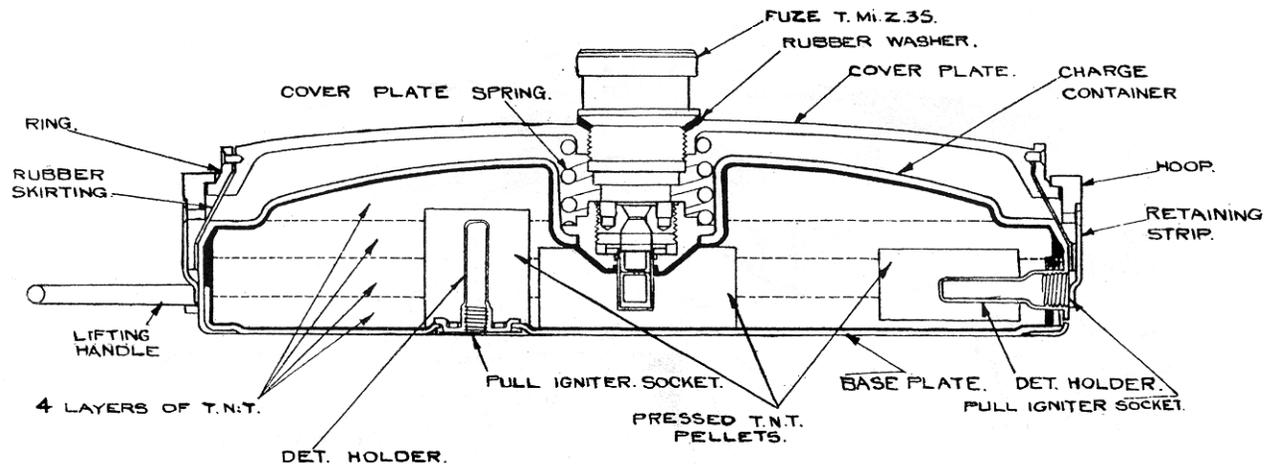


## TELLERMINE—Types 1a &amp; 1b

GERMAN



T. Mi. 35



There are two models of the type 1 Teller Land Mine. Both types, which are painted olive drab, consist of a flat, circular bottom plate, a steel dome-shaped body which contains the bursting charge, an aluminum retaining ring into which a rubber sealing ring is assembled, and a cast aluminum top, also slightly dome-shaped. A formed iron wire handle is attached to the side wall by welded steel straps.

The bursting charge is initiated by action of the pressure igniter which is screwed into the well cup in the top of the mine. This igniter is cylindrical in form, 2.3 inches long, and 1.625 inches in diameter. A heavy compression spring, located inside the well, is held in position by a forward lip on the underside of the top of the mine. Two other well cups, one through the sidewall and one through the bottom plate, are provided for use when auxiliary pull-type igniters are assembled. On the body cover, concentric with a brass setting screw, are stamped two arrows, one pointing to the "Scharf" (armed) marking, and the other to the "Sicher" (safe) marking. A red spot .1 inch in diameter on the head of the setting screw is used to align the setting mechanism with the index marks.

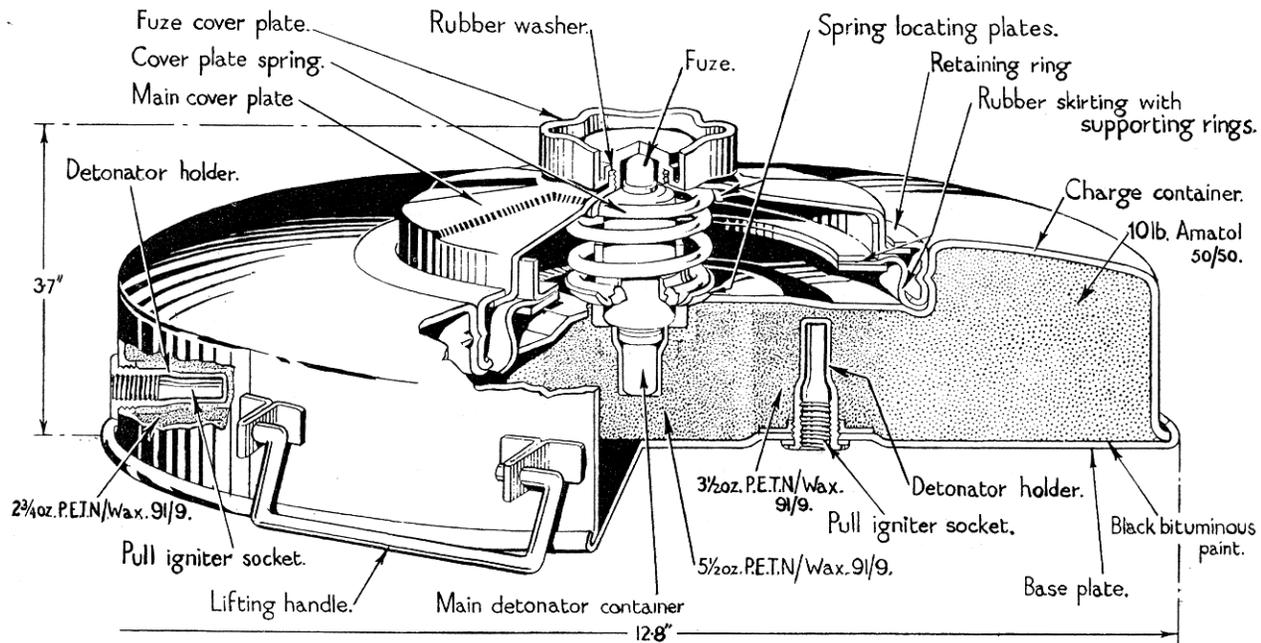
The only difference between type 1a and type 1b is in the loading of the bursting charge. Type 1a contains a 10.55 pound charge of pressed TNT; type 1b contains an 11.41 pound charge of cast TNT and three large PETN booster pellets imbedded in the bursting charge. Each pellet has a cavity into which a detonator well is assembled.

## SPECIFICATIONS

	Type 1a	Type 1b
Diameter .....	12.75 ins.	12.75 ins.
Height .....	3.50 ins.	3.25 ins.
Weight .....	19.25 lb.	21.20 lb.
Bursting charge .....	Pressed TNT	Cast TNT
Bursting charge weight...	10.55 lb.	11.41 lb.
Booster pellets .....		3 PETN

**TELLERMINE—Type 2**GERMAN 

T. Mi. 42



The type 2 Tellermine consists of a flat, circular steel bottom, a steel body having a cylindrical sidewall, and a slightly dome-shaped top with a centrally located well approximately 6.9 inches in diameter. A fluted pressure top is fitted into the well. The silhouette of this mine differs from those of types 1 and 3 principally in that the central pressure top with the fuze well cover extends above the surface of the rest of the body. The mine also contains two other detonator wells, one in the side of the body and one in the bottom.

The igniter body is cylindrical in form and is approximately 1.5 inches long and .81 inch in diameter. The firing-pin head extends above the surface of the body, is hemispherical in shape, and is supported by a heavy shear pin which rests on the upper surface of the body. The lower end has a threaded extension over which a thin metal cap containing a paper disk is screwed. This cap is used as a protection for the primer and, with the paper disk removed, as a means for holding the detonator against the igniter prior to assembly in the mine.

A bursting charge of 10.75 pounds of cast TNT is used. Three PETN booster pellets are imbedded in the bursting charge, one around each detonating well.

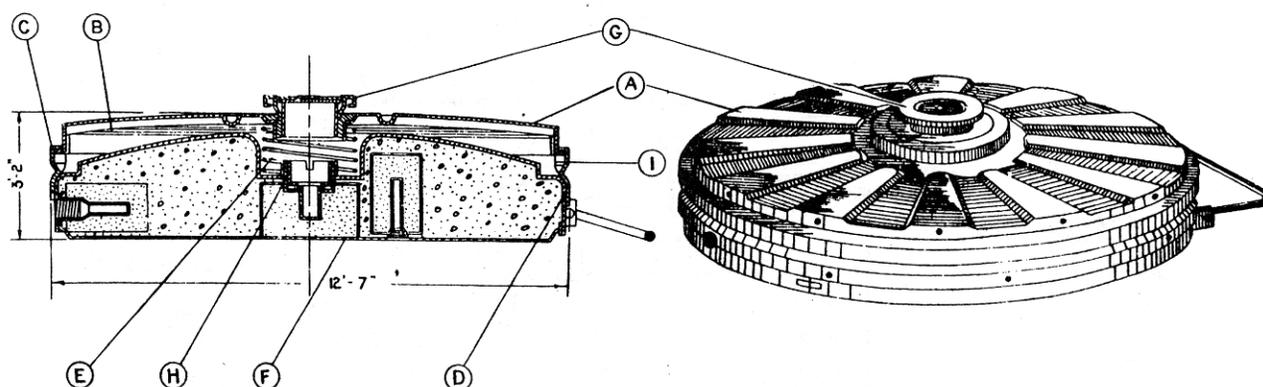
**SPECIFICATIONS**

Diameter .....	12.7 ins.
Height .....	4.00 ins.
Weight .....	18.36 lb.
Bursting charge .....	Cast TNT or 50/50 Amatol
Bursting charge weight.....	10.75 lb.
Booster pellets .....	3 PETN

**TELLERMINE—Type 3 (Steel)**

T. Mi. 35 (Stahl)

GERMAN



The design of the third type of Tellermine does not differ greatly from that of the other two models. It is distinguished by the radial flutings on the upper face (a), which extend to the edge of the surface. On the underside of this pressure plate (a) is a flat strengthening ring (b), spot-welded to the plate.

The ring (c) is secured to the body of the mine (d) by a number of punches. This ring retains the pressure plate in position against the spring (b). The rubber seal (i) between the body of the mine and the pressure plate protects the operating mechanism against moisture and dust.

The mine body and the base (f) are similar in construction to the type 1 T. Mi. 35, type 1 having an adapter to take an additional side igniter, which is located diametrically opposite the handle, and type 3 having an adapter for the base igniter. In the case of type 3, the igniter is screwed down until it rests on the rim of the socket (h), and the screw plug (g) is then not required.

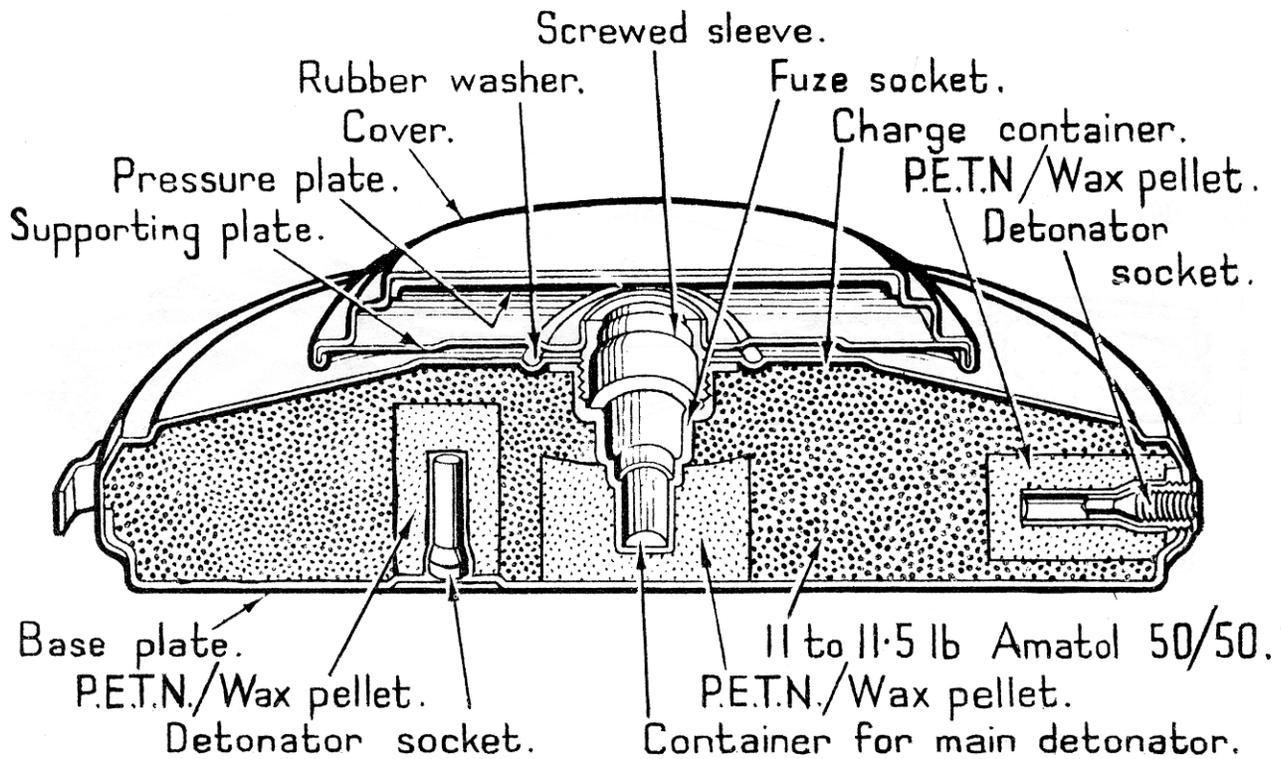
The design for the mine appears to be a compromise between the Tellermine No. 1 and the Tellermine No. 2. In the former the whole of the mine cover forms the pressure plate and the mine is known to be subject to blast effects. The smaller area of the pressure plate in Tellermine No. 2 reduced the susceptibility of the mine to blast but at the same time reduced the available area for operating the mine.

**SPECIFICATIONS**

Diameter .....	12.75 ins.
Height .....	3.21 ins.
Weight .....	21.50 lb.
Bursting charge .....	66-34 Amatol
weight .....	13.9 lb.
Booster pellets .....	3 PETN

**TELLERMINE—Type 4 (Mushroom Head)**GERMAN 

T. Mi. Pilz 43



This type of mine is composed of fewer parts, is simpler in construction, and more easily assembled than types 1, 2, and 3. It also appears to be less susceptible to sympathetic detonation than the three other types.

It has the usual Tellermine contour, but no cover is provided, necessitating a rubber seal and a pressure spring. The top of the mine is covered by a "mushroom" head pressure plate which screws into the fuze cavity. This head is made of two thin pieces of pressed steel formed into a hollow shell about 7.5 inches in diameter and about 1 inch thick.

The mine has an aperture in its base and one in its sidewall in which either a pull or tension igniter can be used.

The fuze for the mine is very simple in operation, and consists of a shear pin and a spring-loaded firing-pin. When sufficient pressure is exerted on the mushroom head, the shear pin is broken off and the spring-loaded firing-pin plunges into the fuze primer, setting off the detonator. The detonator ignites the penthrite booster which, in turn, sets off the main charge of amatol.

This fuze, which is also used in types 2 and 3 German Tellermine, is dropped into the fuze cavity rather than screwed in as in the case of the type 1 Tellermine.

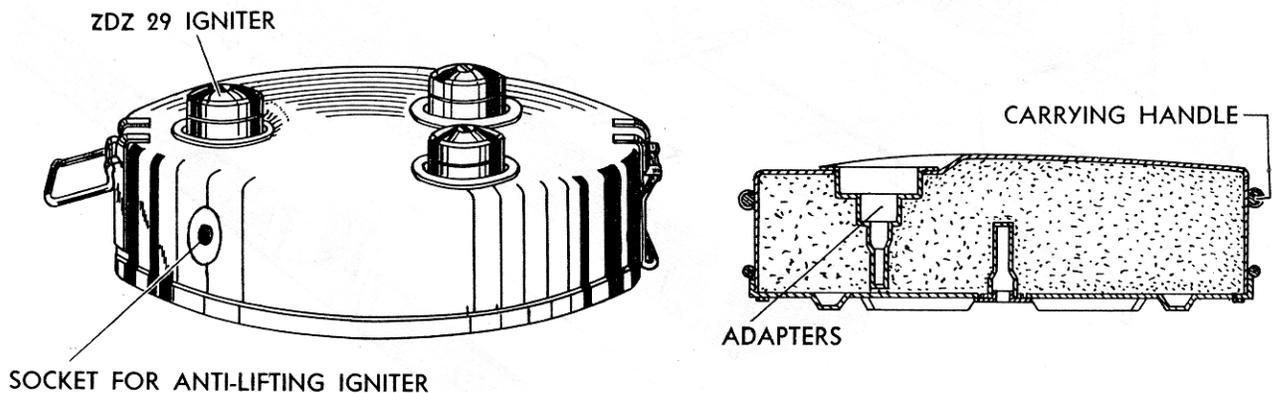
**SPECIFICATIONS**

Diameter .....	11.29 ins.
Weight .....	18 lb., 1.5 oz.
Bursting charge .....	Amatol
Bursting charge weight.....	10 lb., 6.94 oz.

**ANTITANK MINE**

T. Mi. 29

GERMAN



The German Mine, T. Mi. 29, is a light antitank mine having a total weight of 13¼ pounds. It is 10 inches in diameter, 2¾ inches high, and contains a 10 pound charge of cast T.N.T. Outside, the mine is painted olive green; all internal surfaces are shellacked.

The zinc casing comprises two sections: the top, 3/64-inch thick, slides into the base which is 1/32-inch thick, and is secured by eight tabs which pass through slots in the base and are then bent over and soft soldered. Two steel carrying handles shaped to fit close to the case when folded are held by brass strips.

The top is slightly domed and has three adapters sweated into shallow recesses. The adapters have sockets to take the standard German igniters, ZDZ 29. There are three additional sockets provided for fitting anti-lifting igniters: two are in the side of the casing, diametrically opposite one another and four inches to the right of the center of each handle; the other is in the center of the base. In addition to being sweated into the casing, each socket is secured by two brass pins which fit into slots on either side of the hole in the mine casing.

The ZDZ 29 can function as either a push or pull igniter. When it is used as a pressure igniter, there is a choice of two settings allowing the mine to fire under medium or heavy loads. The operation depends respectively on the shear of one or two pins acting as detents to a spring-loaded striker pellet. When in use as a pull igniter, the operation depends upon the withdrawal of one detent pin from the spring-loaded striker pellet.

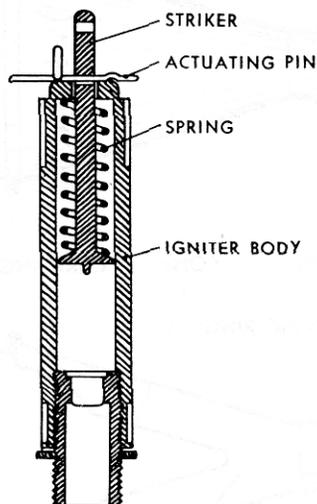
The igniter is held in a "safe" position by the insertion of a safety key into a slot in the main body. The key slides under the striker pellet, preventing the striker from moving until the key is withdrawn.

# WOODEN BOX MINE

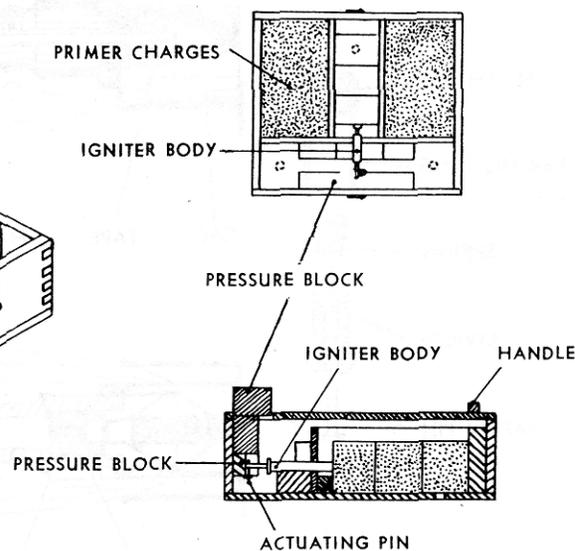
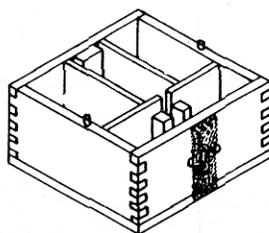
GERMAN



Holzmine 42



Z. Z. 42  
FUZE



The body of the German Holzmine 42 consists of a wooden box of  $\frac{3}{4}$ -inch lumber divided into four compartments by removable partitions. The two side compartments contain the main explosive filling; the central compartment the 7-ounce primer charges; and the end compartment the operating mechanism.

The main filling consists of two charges of 50/50 Amatol covered with a bitumastic substance as a protection against water. While it is believed that several different types of primer charges are used, three Sprengkorper 28 charges are presumed to be standard for the mine.

The end compartment contains a shearing flange secured to the outside wall by two  $\frac{3}{8}$ -inch wooden dowels. It is provided with a central slot to receive the end of the striker. The igniter rest consists of a small block of wood with a U-shaped piece cut out at the top, and screwed to the base from the underside.

When the mine is armed, the feet of the pressure block rest on the shear flange, in which position the head of the pressure block projects about two inches above the lid. During transit, the pressure block is reversed so that the feet rest on blocks in the bottom of the box.

A pressure of approximately 200 pounds on the pressure block shears the dowels securing the shear flange to the outer wall of the mine and forces the flange down onto the igniter pin which is withdrawn freeing the spring-loaded striker. The fuze used is the standard German Z. Z. 42.

The Holzmine 42 has also been used as a booby trap by employing an anti-lifting device. This device which is fitted into a hole underneath the central compartment is believed to consist of a Z. Z. 35 fuze screwed into a 7-ounce charge.

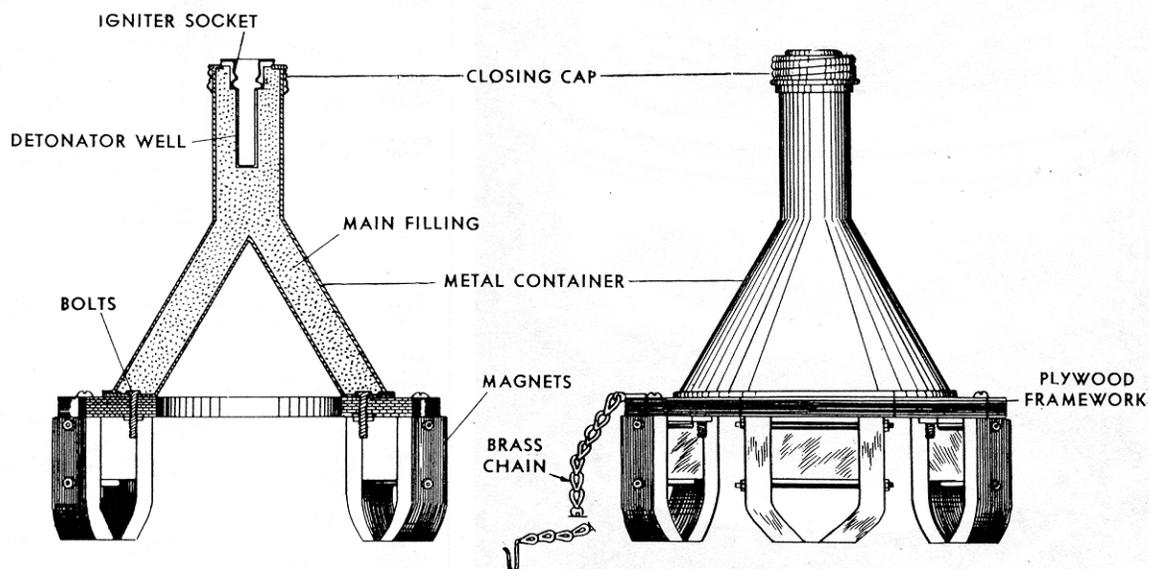
## SPECIFICATIONS

Internal dimensions .....	11.4 x 10.7 x 3.2 ins.
Size of lid .....	13 x 12 x $\frac{3}{4}$ ins.
Size of aperture in lid .....	6.4 x 2.5 ins.
Pressure block (without feet)...	6 x 2.4 x 2.4 ins.
Size of compartments:	
Main charges .....	4.5 x 7.7 ins.
Priming charges .....	1.7 x 6.8 ins.
Thickness of partitions .....	.19 in.
Size of shearing flange .....	7.6 x 1.25 x .5 ins.
Size of slot in shearing flange .....	.27 x .67 in.
Size of wooden blocks..	3.1 x .78 x .86 ins. deep
Main explosive .....	Amatol 50/50
Total weight of explosive .....	11.9 lb.
Total weight of mine .....	18 lb.

**MAGNETIC HOLLOW CHARGE ANTITANK MINE**

Haft-Hohlladung 3 Kg.

GERMAN



The German magnetic, hollow-charge, antitank mine, designed for use by tank-hunting squads, consists of a main filling of TNT in a pressed metal container of conical shape. The conical container has an elongated apex threaded externally at its upper end to receive a closing cap. The closing cap is fitted with a detonator well, and threaded internally to receive a standard (B. Z. E.) friction igniter which has a 4.5 second delay.

The base of the cone is attached to a plywood framework. Three horseshoe type magnets, sufficiently powerful to cause the mine to adhere to a vertical surface, are fixed to the bottom of the frame. During transit, the magnets are fitted with a keeper. A brass chain terminating in a hook is also attached to the frame.

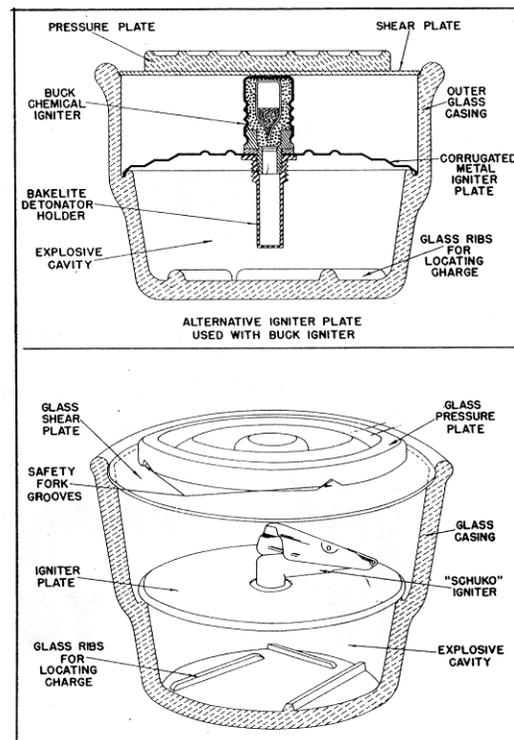
**SPECIFICATIONS**

Weight of live charge .....	7 lbs., 12½ oz.
Weight of explosive (TNT) .....	1 lb., 15½ oz.
Weight of booster (Pentrite) .....	3 oz.
Height of charge .....	10¾ ins.
Height of bursting charge container.....	7¾ ins.
Height of magnets .....	2¾ ins.
Height of apex of hollow cone .....	67/16 ins.
Diameter of base of hollow cone .....	43/16 ins.

## GLASS MINE (ANTIPERSONNEL)

Glasmine 43 (f)

GERMAN 



The mine consists of an outer glass casing, the upper portion of which is  $\frac{1}{4}$ -inch thick and the lower portion  $\frac{2}{5}$ -inch thick. The external diameter at the base is  $4\frac{1}{2}$  inches and at the top, 6 inches at the widest part.

A grooved shoulder on the inside of the case, about 2 inches from the bottom, supports the igniter plate. The mine may employ either a Buck chemical igniter or a new mechanized igniter, the Schuko. When the latter is used, the igniter plate consists of a thin sheet metal plate, which has a central hole for the igniter. When the Buck igniter is used, however, an igniter plate having the same diameter and igniter hole but of stronger design is employed. Around the top of the case is a grooved ledge which supports a thin glass shear plate approximately  $\frac{1}{32}$ -inch thick.

A moulded glass pressure plate of  $\frac{3}{4}$ -inch extreme thickness and  $4\frac{1}{2}$  inches in diameter rests on the shear plate. There are two parallel grooves on the underside of the pressure plate which are designed to accept a metal safety fork that will bridge the outer edge of the mine and support the pressure plate until such time as the mine is laid. The two prongs are then withdrawn through the two grooves arming the mine. This fork is not supplied with the mine but is improvised by units.

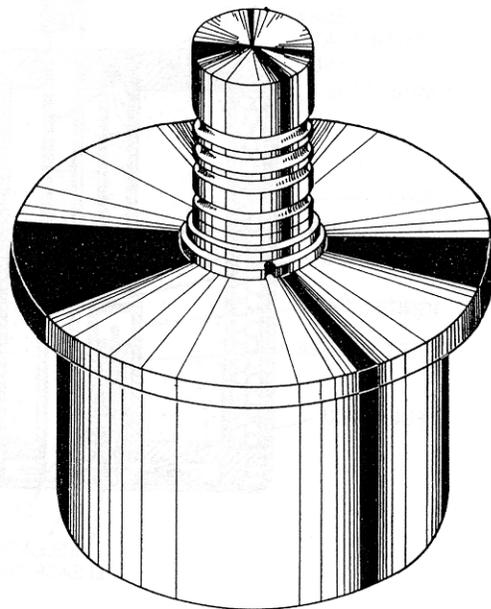
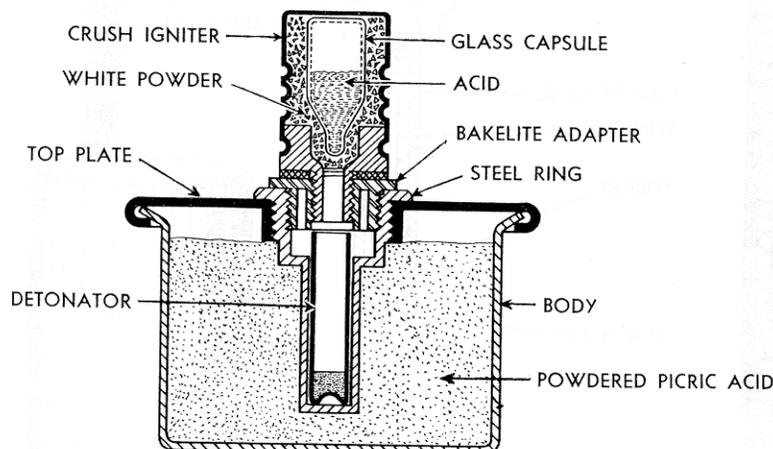
Four raised strips moulded in the bottom of the mine are spaced so as to take a standard 200 gm. charge (Sprengkorper 28). When sufficient pressure (40 lbs.) is applied to the glass pressure plate, the shear plate is broken and crushes the top of the Buck igniter or trips the actuating lever of the Schuko igniter, depending on which is employed.

## SPECIFICATIONS

Weight of standard charge .....	200 gm
External diameter at top .....	6 ins.
External diameter at base .....	4.5 ins.
Height to lip of container .....	4.2 ins.
Thickness of casing (upper) .....	.25 in.
Thickness of casing (lower) .....	.4 in.

**ANTIPERSONNEL MINE**

Behelfs-Schützenmine S. 150

GERMAN 

The German Behelfs-Schützenmine S. 150, known to allied troops in the field as the "Pot Mine," "Picric Pot," "Mustard Pot," or "Jerry Mine," consists of a cylindrical body, a top plate, and a crush igniter.

The body, which is made of pressed steel, contains a 5¼ oz. explosive charge of powdered picric acid. A chemical crush-actuated igniter is screwed into the mine by means of a brass or plastic adapter which fits into the top of the body. A synthetic rubber washer is provided between igniter and adapter for waterproofing the mine. The igniter, known as the German Buck Igniter (Chemischer Zünder Buck) consists of a thin metal drum with circumferential grooves to reduce its resistance against vertical pressure. It contains a glass ampule half filled with acid and surrounded by a white powdered flash composition. A small brass detonator (German Nr. 8) is inserted into the detonator pocket.

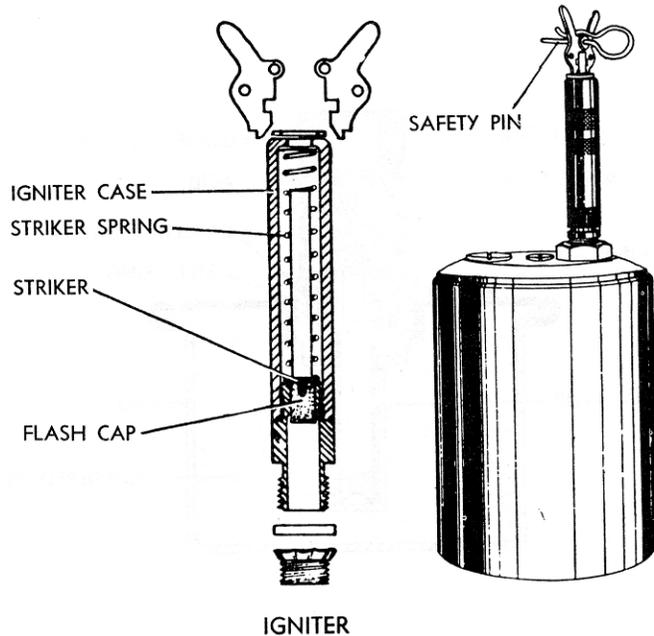
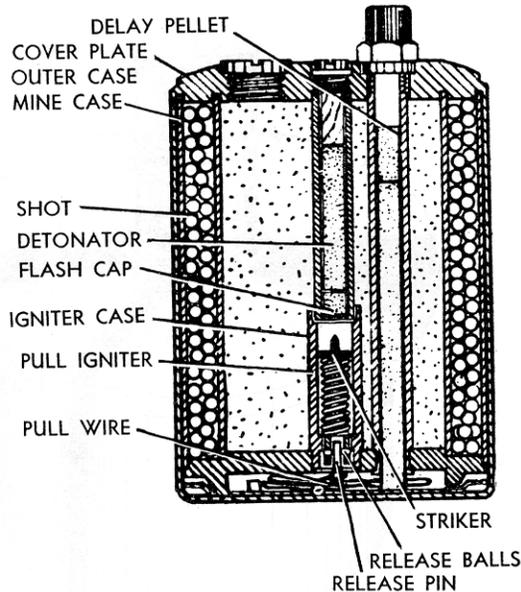
A moderate pressure on the top of the igniter crushes the metal drum and the glass inside it. The acid pours into the white powder, and a flash resulting from their chemical interaction sets off the detonator which in turn sets off the mine.

**SPECIFICATIONS**

Height of body .....	2 ins.
Diameter of body .....	2½ ins.
Diameter of top plate .....	3 ins.
Height of igniter .....	1½ ins.
Diameter of igniter .....	¾ in.
Depth of detonator pocket .....	1½ ins.
Total weight .....	12½ ozs.
Weight of igniter with adapter .....	1 oz.
Explosive charge .....	Powered picric acid (5¼ oz. approx.)
Color .....	Mustard brown

**ANTIPERSONNEL MINE**

S. Mi. 44 mit S. Mi. Z. 44

GERMAN 

This anti-personnel mine is basically the same, both in construction and operation, as the S. Mi. 35 described on page 305. It consists of an outer casing and an inner cylinder which contains a T.N.T. charge surrounded by small shot. There are three threaded openings in the cover plate: one is used for pouring the charge into the mine; the second, which takes a S. Mi. Z. 44 igniter, opens into a tube containing a 4.5 second delay pellet and a propellant consisting of three grams of fast burning gun powder; the third which is closed by a wooden plug leads into a tube containing a detonator, a flash cap, and a pull igniter. The pull igniter, located at the base of the tube, contains a spring-loaded striker held in place by two steel balls which are prevented from moving by a pin in the base of the igniter. The pin is attached to the base of the outer case by approximately three feet of coiled wire.

The S. Mi. Z. 44 is a percussion igniter differing from the usual percussion type in that it has two small wings which, when forced outward by pressure from above or tension through trip wires from the side, release the spring-loaded striker to fire the cap. A pressure of 21 pounds or a tension of 14 pounds will actuate the igniter.

Operation of the igniter initiates the 4.5-second delay pellet which fires the propellant throwing the mine upwards. When the coiled wire is fully extended (about 2½ feet above ground level) it pulls the pin from the igniter, enabling the retaining balls to move inward and release the striker to fire the flash cap, detonator, and bursting charge.

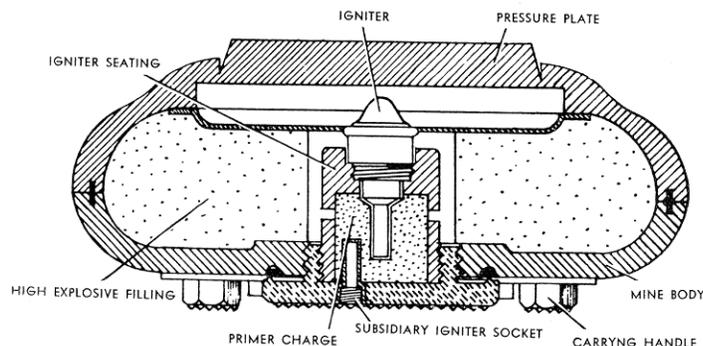
**SPECIFICATIONS**

Height .....	5½ ins.
Height with igniter .....	8¾ ins.
Diameter .....	4 ins.
Weight .....	8.8 lb.
Color .....	Camouflage yellow

# ANTITANK MINE

## Topf Mine

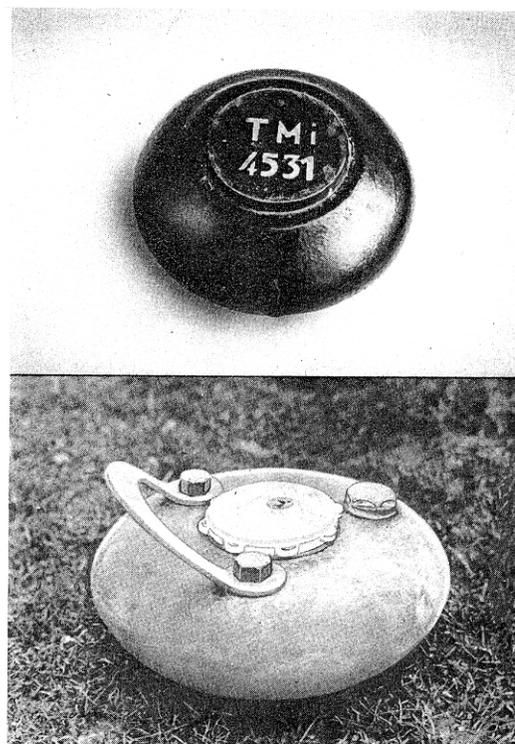
GERMAN 



Above: A cross-section of the antitank topf mine showing principal parts.

Upper right: Top view.

Lower right: Bottom view showing carrying handle.



The Topf Mine, a completely non-metallic, waterproof, anti-tank mine, consists of a circular body filled with a 12½-pound charge of TNT, a primer plug assembly, and an igniter. The top of the mine is flat, with a fixed pressure plate in the center slightly higher than the surface; a 4½-inch circular recess located in the bottom takes the primer plug and igniter assembly. The outer casing is made of a hard pulp-like material covered with pitch. The mine rests on three glass studs; two of the studs secure a pasteboard carrying handle, while the third, which is sometimes larger than the two others, is used as a filler plug.

The primer plug assembly consists of a glass screw cap and a cylindrical wooden booster holder, the top of which has a deep threaded recess to take the Topf Mine Igniter. A subsidiary igniter socket in the glass cap leads to the booster charge, and is threaded to take a standard igniter.

The Topf Mine Igniter, which is made of glass, has no safety device. It comprises a cylindrical glass body 3 mm thick; a solid glass pressure head, hemispherical in shape and two small glass ampules, one of which contains sodium and potassium as a liquid alloy and the other ethyl nitrate. The ampules are held in position by a black celluloid disc. A thin bakelite detonator well is provided.

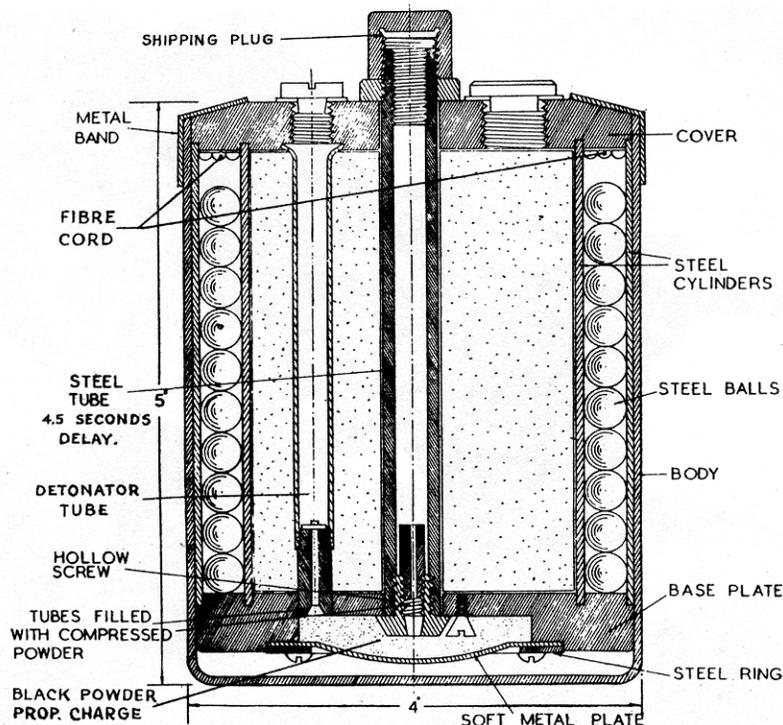
The mine is activated by a pressure of at least 330 pounds, which forces the pressure plate down onto the igniter head and thereby breaking the two glass ampules. A flash results, setting off the detonator, booster, and main charge. If a standard igniter is used, the mine must be laid upside down.

## SPECIFICATIONS

Diameter of mine .....	12½ ins.
Height of mine .....	5½ ins.
Weight (complete) .....	20 lbs.
Weight in crate .....	29 lbs.
Filling .....	TNT
Weight of filling .....	12½ lbs.
Firing pressure .....	330 lbs.
Height of igniter (including cap) .....	3½ ins.
Diameter of igniter body .....	1½ ins.
Shear pressure of igniter .....	132 lbs.
Overall height of primer plug assembly....	3.1 ins.
Diameter of primer holder .....	2½ ins.
Diameter of glass cap .....	4.6 ins.

**ANTIPERSONNEL SHRAPNEL MINE**

(S. Mi. 35)

GERMAN 

The German shrapnel mine is an antipersonnel device which may be operated by direct pressure of about 15 pounds on a push igniter in the head, or by a pull on one or more trip-wires attached to pull-igniters. It may also be fired by electrical methods.

The mine is cylindrical in shape; its height is 5 inches, its diameter is 4 inches, and it weighs approximately 9½ pounds. It contains an explosive charge of about 8 ounces in some models and 1 pound in others, and approximately 350 steel balls.

An inner cylinder of pressed steel is fitted into the outer jacket, resting on a metal disk which is fixed to the bottom of the outer cover. The charge is contained in a movable cylinder which is screwed to the disk in the bottom of the mine. This cylinder has a central tube and three other parallel tubes. A train of powder in the bottom of the central tube, 2 grams of powder in a recess under the movable cylinder, and the shrapnel, which is contained in the space between the inner jacket and the movable cylinder, complete the assembly.

A cover plate is attached to the mine. This plate has an opening through which the central tube passes, and three other openings in alignment with the three parallel tubes in the powder container.

For firing, an igniter is screwed to the central tube, and a detonator is inserted (sometimes two) in each one of the three other tubes. When the igniter fires, the flame produced flashes down the center tube, setting off the small powder charge which throws the inner cylinder into the air. At the same time, the detonators are ignited, and they in turn set off the main charge. The delay in detonation of this charge permits the casing to rise from 6 to 7 feet into the air before exploding. The shrapnel filling is effective up to a range of about 150 yards to 200 yards.

**SPECIFICATIONS**

Height (without igniter).....	5 ins.
Weight of mine (approximate).....	9½ lb.
Weight of filling (approximate) TNT....	8 oz. to 1 lb.
Type of filling.....	TNT and PETN
Diameter of mine.....	4 ins.
Diameter of steel balls.....	.372 in.
Mine wall thickness.....	.050 in.
Weight of 350 steel balls.....	2 lb., 10.67 oz.
Black powder propellant.....	0.15 ozs.
Explosive carton complete.....	1 lb., 0.14 oz.

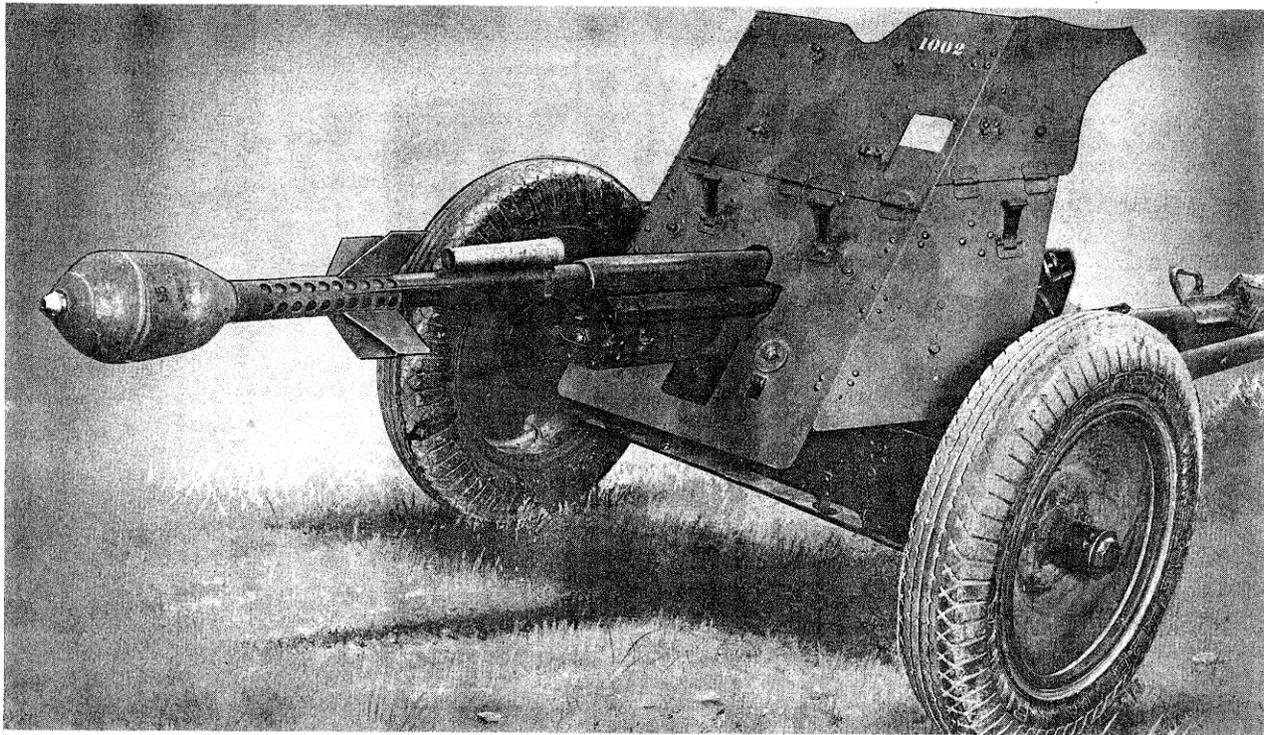
Three types of igniters are used:

- Pressure type
- "Y" adapter w/2 pull igniters
- Electric squib type

## 3.7 cm STICK GRENADE

3.7 Stielgranat 41

GERMAN



This deadly device is a hollow charge finned bomb for use on the 37 mm German Pak. It is believed that this type of ammunition was developed for the purpose of making this obsolescent gun more effective for antitank use.

The stick bomb which is made of pressed steel has a steel rod which fits into the bore and a perforated sleeve which fits around the barrel of the gun. The hollow charge is at the rear of the steel cup (or cone) and consists of two blocks of TNT with cyclonite. A nose fuze of the instantaneous percussion type and an instantaneous tail fuze are used. The nose fuze is used for impact against armor and the tail fuze is for graze action. Both fuzes arm on setback. The propelling cartridge consists of a steel case and is charged with tubular stick powder, an igniting charge of granular powder, and a percussion type primer.

Twenty-nine of these grenades were tested at Aberdeen. One was statically detonated against the face of 7-inch homogeneous armor plate. It penetrated completely, leaving a hole 2½ inches wide at the face and 1½ inches at the rear. The other rounds were fired from a German 37 mm A.T. gun for which they were designed. Range was found to be 203 yards at 5° elevation and 857 yards at 25° elevation. Accuracy was hard to determine because of the inexperienced gun crew.

## SPECIFICATIONS

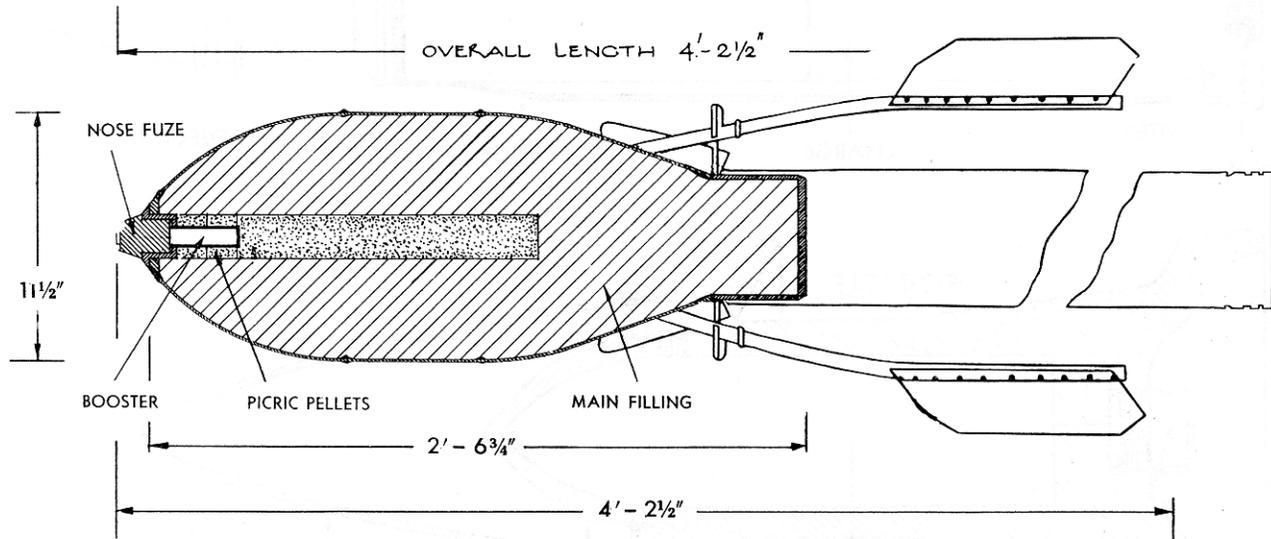
Caliber of rod.....	37 mm
Weight of grenade as fired.....	18 lb., 12 oz.
Weight of burster.....	5 lb., 5 oz.
Weight of propelling cartridge.....	1 lb., 6 oz.
Overall length of round.....	29½ ins.
Diameter of projectile body.....	6¼ ins.
Types of fuze.....	1—P. D. Instantaneous 2—B. D. Instantaneous
Average velocity .....	350 f/s
Average pressure .....	18,600 p.s.i.
Range	
5° elevation .....	203 yds.
25° elevation .....	857 yds.

**15 cm STICK GRENADE**

GERMAN



15 cm Stielgranate



The German 15 cm high explosive Stick Grenade is reported to be used with the 15 cm heavy infantry gun, s. I. G. 33. Its prime purpose is for demolition, and for clearing minefields and wire obstacles. Of welded steel construction, the bomb has a 1/8-inch case consisting of three main parts: the nose, a cylindrical center piece, and a tapered rear piece. Both the nose and the base are reinforced with steel rings welded to the casing. The ring in the nose is tapped to receive the fuze adaptor; that in the base to accommodate a steel cup. This cup, which has machined surfaces, is 3/8-inch thick at the base and 3/16-inch at the sides. A stick unit which leaves the bomb approximately 150 yards from the muzzle of the gun fits over the cup. According to reports, the unit weighs 22.2 kg. (49 lb.) and the propelling charge 5.5 (12 1/2 lb.).

The main filling consists of approximately 60 pounds of poured 50/50 Amatol. A 2-inch cylindrical booster charge made up of compressed T.N.T. pellets is located in the center of the main filling about 15 inches from the booster; two normal annular picric pellets surround the booster. The bomb is fitted with a percussion type nose fuze, Wgr. Z.36, which is also reported as being used in the German 20 cm Spigot Mortar Bomb. The tail, of unusual construction, has three tubular steel sockets equally spaced around the bomb and projecting from the rear portion of the casing at an angle of 20° to the main axis. These sockets receive tubular bars to which the sheet steel tubular fins are attached. The bars are bent in order to bring the fins parallel to the main axis and also to provide clearance of the muzzle of the gun. In addition there are six 5/32-inch steel plate fins welded to the casing and spaced in pairs between the tubular sockets.

**SPECIFICATIONS**

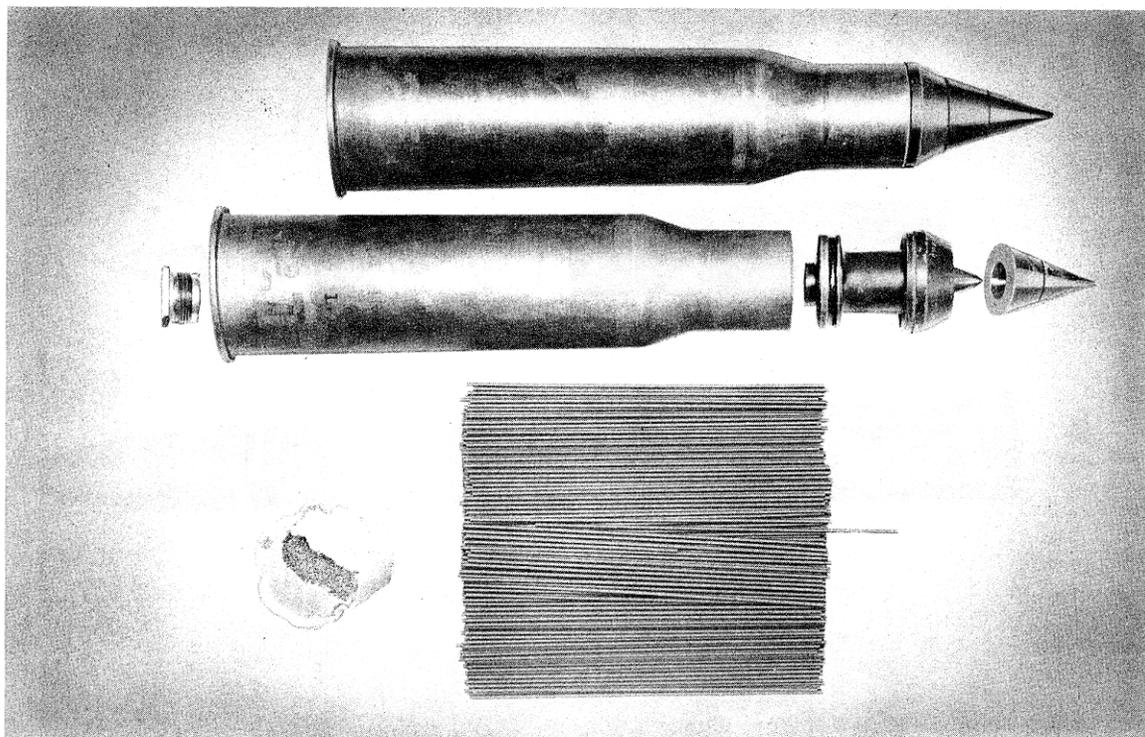
Overall length .....	50 1/2 ins.
Overall length (excluding tail fins & fuze) .....	30 3/4 ins.
Diameter (maximum) .....	11 1/2 ins.
Thickness of casing .....	1/8 in.
Total weight (approx.) .....	105 lb.
Weight of filling (approx.) .....	60 lb.
Color .....	Field grey

## 5 cm ARROWHEAD AMMUNITION

GERMAN



5 cm Pzgr. patr. 40 Pak



This fixed round of ammunition is fired from the old model of German 5 cm short-barrel tank gun. The projectile has a plastic needlepoint ballistic cap, a mild steel projectile body, a tungsten carbide core, and a tracer. The cartridge case contains a propelling charge of diethylene glycol dinitrate tubular stick powder, and a charge of nitrocellulose granular igniter powder. An electric primer containing a quickmatch and black powder charge is also used.

The center of the projectile body is trimmed down, lightening the round and giving the ammunition an extremely high muzzle velocity. Armor-penetrating qualities are very good, but can be used only for short ranges due to the instability of the projectile in flight. On impact with armor plate, the plastic ballistic cap shatters and the tungsten carbide core is the only part that penetrates.

The projectile is unusual in that the forward bearing surface acts as the rotating band, and the rear bearing surface as the bourrelet. The rear bearing surface is in two parts, due to the crimping groove dividing it.

## SPECIFICATIONS

Weight of complete round.....	5 lb., 3 oz.
Weight of projectile as fired.....	1 lb., 15.86 oz.
Weight of tracer composition (kind not known) .....	0.12 oz.
Weight of primer composition (quick-match and black powder).....	0.07 oz.
Weight of igniting charge (nitrocellulose granular) .....	0.45 oz.
Weight of propellant.....	1 lb., 2.69 oz.
Length of complete round (overall).....	14.480 ins.
Length of projectile w/tracer cup.....	5.75 ins.
Length of cartridge case.....	11.342 ins.
Diameter of bourrelet.....	1.950 ins.
Diameter of rotating band.....	2.269 ins.
Diameter of body midway of projectile	1.258 ins.

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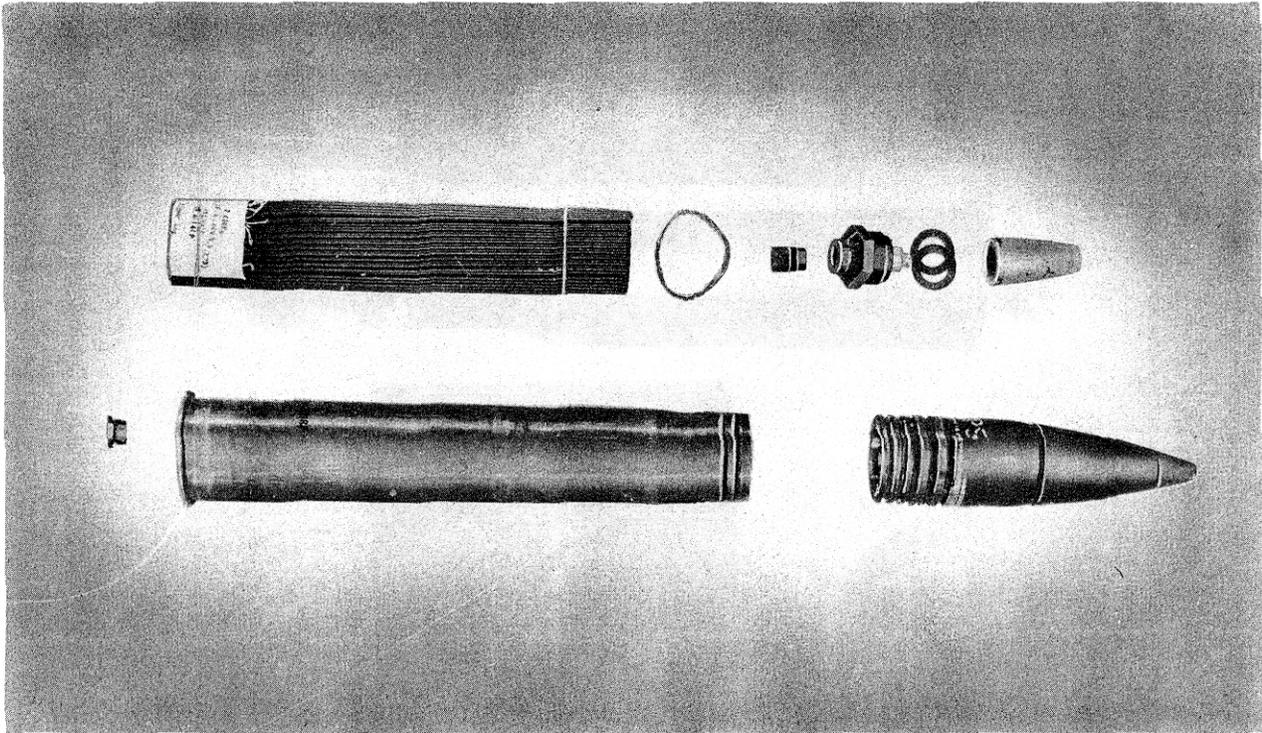
OFFICE CHIEF  OF ORDNANCE

**8.8 cm A.P.C.B.C., H.E. AMMUNITION**

GERMAN



8.8 cm Pzgr. patr.



The German 8.8 cm A.P.C.B.C., H.E. ammunition consists of an armor-piercing capped projectile of conventional design, crimped in a primed brass cartridge case. The projectile is loaded with a TNT bursting charge and fuze with a base-detonating fuze containing a tracer. The brass cartridge case holds a double base, single-perforated propelling charge with a nitrocellulose powder igniter and a short percussion type primer.

The projectile as fired weighs 20.71 pounds. Both the projectile body and the armor-piercing cap are made of steel. The cap is soldered to the body, and a sheet steel windshield is attached to the cap by a series of spot welds. The large fuze body occupies a considerable part of the explosive cavity which is comparatively large for an armor-piercing projectile. The weight of the explosive charge is approximately 1.8% of the total weight of the projectile. The bursting charge is contained in an aluminum case conforming to the contour of the cavity except that the forward end is flat. A molded plastic button which conforms to the contour of the cavity is located between the front of the charge case and the small forward end of the cavity. This button acts as a cushion for the charge upon impact of the projectile on the target. A tar-like compound fills the space between the projectile walls and the aluminum charge case to prevent the case from slipping upon rotation of the projectile.

The pressed bursting charge has 5.5% wax blended with it. The base fuze has a steel body with a threaded extension at the base end to receive a tracer assembly.

The fuze has a slight delay and arms on centrifugal force.

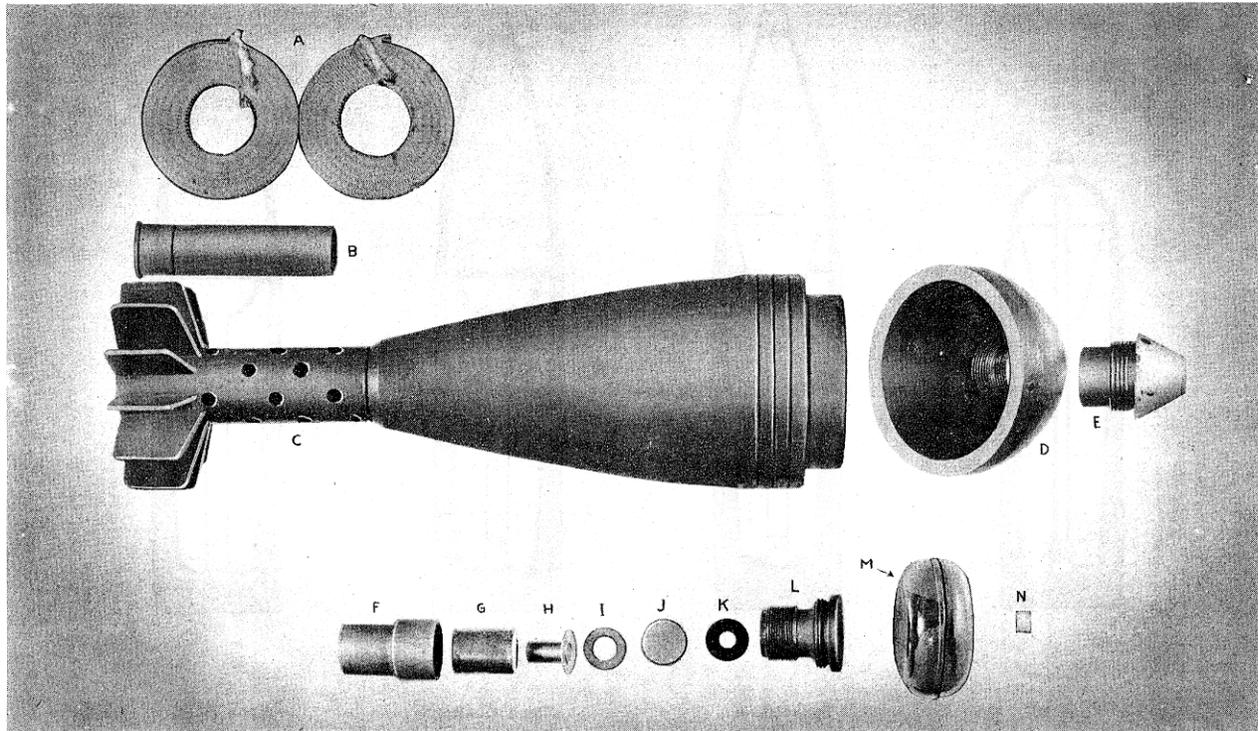
**SPECIFICATIONS**

Type of ammunition.....	A.P.C.B.C., H.E.
Weight of complete round.....	32.74 lb.
Weight of projectile.....	20.71 lb.
Weight of bursting charge.....	.37 lb. (1.8% of wt. of proj.)
Weight of propellant.....	2,471 grams
Weight of fuze with tracer and detonator assembly .....	2.18 lb.

# 8 cm MORTAR SHELL—"Bouncing Betty"

GERMAN 

8 cm Wurfgranate 39



The 8 cm Wgr. 39 consists of a nose fuze, front cap, rear body, and tail assembly. The body, which is separated from the cap at the ogive, has a standard shape and TNT filling. The cast nose cap fits over a cylindrical boss, concentric with the longitudinal axis of the projectile. This cap is secured to the boss by four shear pins that extend through the cap and the boss. The seam where the two parts are joined is then shellacked to form a watertight seal.

An impact type, nondelay fuze is screwed into the cap; inside the cap is a plastic container of about 1½ ounces of smokeless powder. Under the charge, screwed into the projectile body, is an iron plug with a small axial hole through it. This plug separates the smokeless powder charge from the combination delay pellet and booster which is in an aluminum container.

The tail assembly is a standard type, having the usual base charge, ring increments, and fin assembly.

Upon impact, the nondelay fuze ignites the smokeless powder charge, sending a flash through the hole in the separating plug, setting off the delay pellet. The explosion from the first charge shears the pins holding the nose cap to the projectile body, and throws the shell from 5 to 10 feet into the air. In the meantime, the booster detonates the main TNT bursting charge at approximately the moment when the projectile is at the height of its bounce. This gives the effect of an air burst without the use of a precision time fuze. Height of the burst is governed by the angle of the shell axis with the ground at the time of impact.

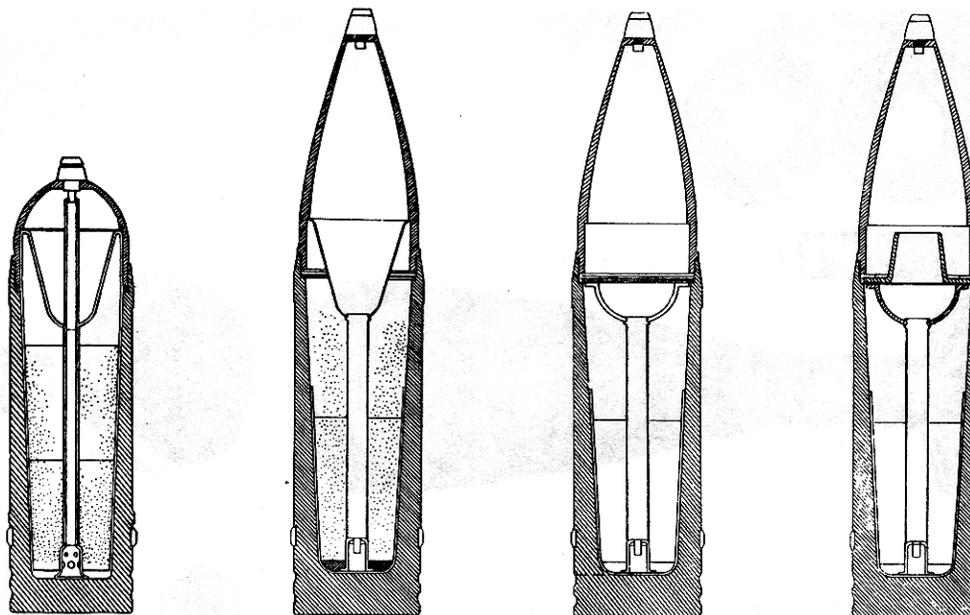
## KEY TO PARTS

- (A) Propellant increments
- (B) Propellant cartridge
- (C) Projectile body
- (D) False ogive
- (E) Point ignition fuze—Wgr. Z 38 st
- (F) Booster well
- (G) Booster capsule
- (H) Delay type detonator
- (I) Paper washer
- (J) Paper diaphragm
- (K) Plastic washer
- (L) Booster well adapter
- (M) Ejector capsule
- (N) Ejector capsule igniter

# HOLLOW CHARGE AMMUNITION

10.5 cm HL, HL/A, HL/B, HL/C

GERMAN 



Type HL

Type HL/A

Type HL/B

Type HL/C

There are four known variations of the 10.5 cm (105 mm) Hollow charge ammunition fired from the German 10.5 cm le. F. H. 18 series:

Type H1 has a deep conical cavity, a short ogive, and flash tube extending through the shaped cavity to the fuze booster. All types have an additional detonator booster combination at the base of the flash tube.

Type H1/A has the same shaped cavity but has a larger diameter flash tube that is attached to the apex of cavity liner by a pressed collar, and does not extend into the cavity. This type has a long ogive.

The principal difference between types H1/A and H1/B is in a shallower, hemispherical-shaped cavity. The principal difference between types H1/B and H1/C is the addition of a funnel-like steel washer inverted over the cavity. This funnel is supposed to counteract the effects of centrifugal force on the hollow charge jet.

The explosive filler is pressed into two pellets in types H1/A, H1/B, and type H1/C. Explosive fillers in all rounds are inclosed in waxed paper cartons. The metal ogive screws into the projectile, holding all components of the filler in place.

The aluminum fuze (AZ 38) carries the primer detonator. It is armed by centrifugal force and contains no other safety features. It functions by a "spit" from the booster, which travels down the central tube and initiates the base booster, and hence the main bursting charge.

## ESSENTIAL MODIFICATIONS

Type H1/A: (a) Lengthened nose-piece (ogive), giving greater standoff. (b) Elimination of flash tube between fuze and apex of cavity and larger diameter of flash tube.

Type H1/B: (a) Further increase of standoff obtained by shortening the HE filler. Nose piece is identical with that of Type H1/A. (b) Hemispherical cavity instead of rounded cone. (c) HE filling RDX/WAX, instead of RDX/WAX/TNT.

Type H1/C: Introduction of a washer, shaped like an inverted funnel in front of the cavity. Otherwise, types B and C are essentially identical.

## SPECIFICATIONS

	H1	H1/A	H1/B	H1/C
Weight of projectile as fired:	25.8 lb.	27.1 lb.	26.6 lb.	27.2 lb.
H.E. filling, carton, wax:		4.6875 lb.	3.5 lb.	3.255 lb.
Empty shell:		22.55 lb.	22.937 lb.	22.315 lb.
Collar ("funnel")				.5195 lb.
Muzzle velocity f/s*	1375	1360	1360	1360

Estimated performance at normal against Homogeneous armor.

Type H1/A—170 mm (static) 105 mm (dynamic)

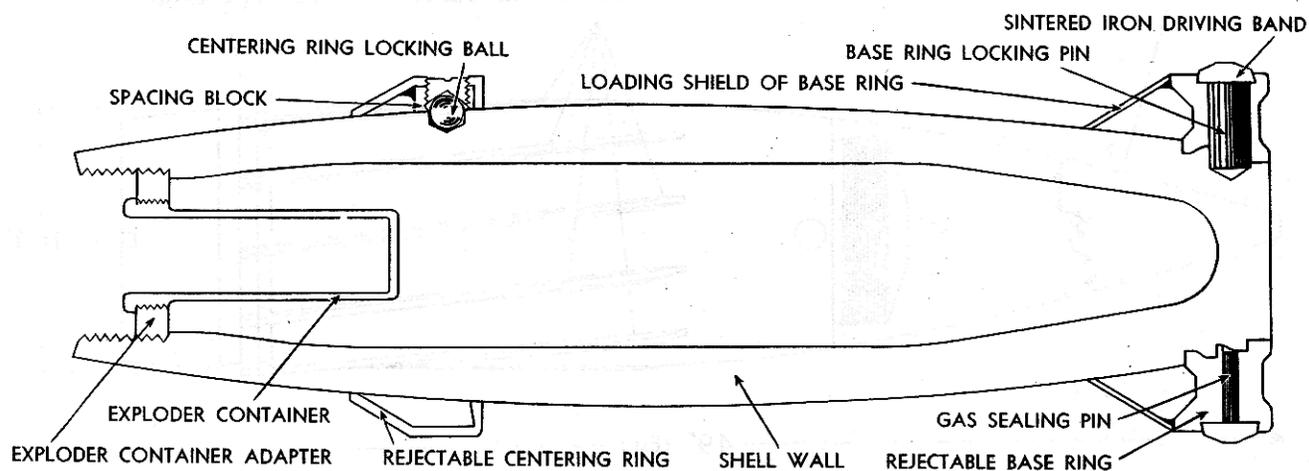
Type H1/B—155 mm (static) 100 mm (dynamic)

Type H1/C—155 mm (static) 100 mm (dynamic)  
(From German claims)

\*Firing with charge five which is normally used.

## 10.5 cm "SABOT" TYPE H. E. SHELL

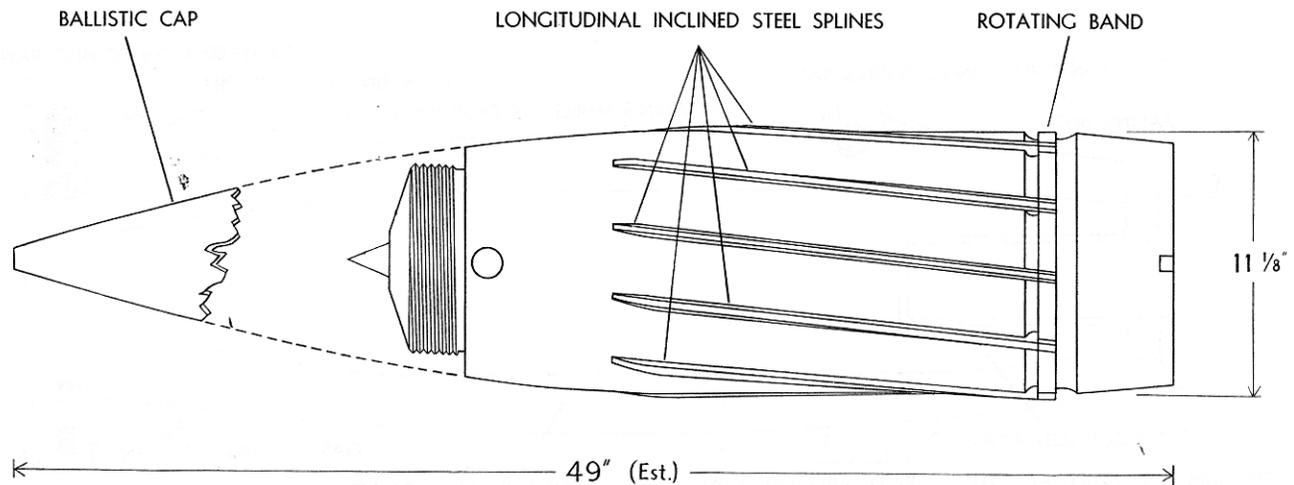
GERMAN



This new type projectile consists of an 8.8 cm streamlined shell body fitted with centering and rotating band rings which permit it to be fired from a 10.5 cm weapon. Both the centering ring and rotating band ring are so designed that they become detached from the shell body under the influence of centrifugal force on leaving the muzzle of the gun. The advantage of such a design, provided it functions properly, is that a lighter weight projectile of smaller diameter is fired from a 10.5 cm weapon instead of the normal 10.5 cm projectile. The effect is to give a higher muzzle velocity and longer range for the 8.8 cm streamlined shell body than would be obtained with the standard 10.5 cm high explosive projectile. However, the effectiveness is reduced due to lower weight of projectile.

One disadvantage of this type of shell lies in the possibility of injury to friendly troops when the centering rings and rotating band are cast from the projectile. The centrifugal force would make these pieces into dangerous missiles.

The complete weight of the projectile is 23 pounds. Projectiles examined have been filled with a high explosive charge, and fitted with a percussion type nose fuze (AZ 23v.). The 15 cm shell of similar design employs the same fuze. The explosive trains of these projectiles are similar to those for the usual type of German high explosive shell.

**28 cm RIFLED PROJECTILE**GERMAN 

This pre-engraved projectile recovered in Italy is used for long range bombardment. It has longitudinal inclined steel splines and a single one-inch-wide copper band that acts as a gas seal. The splines are set at a slight angle to the axis of the projectile and are 19.2 inches in length. In loading the projectile, the splines are lined up with the rifling of the gun tube. The shell is 33 inches in length, exclusive of the windshield. Fragments indicate that the windshield would add an extra two feet to the length.

A nose percussion fuze (AZ 35 K) and a base fuze (BD Z 35K) are fitted. The Germans are reputed to have four types of 28 cm railway guns able to employ this type of projectile. They are: 28 cm Br. N. Kan E.; 28 cm K. 5 (E); 28 cm K. 5/1 (E); and 28 cm K. 5/2 (E).

**SPECIFICATIONS**

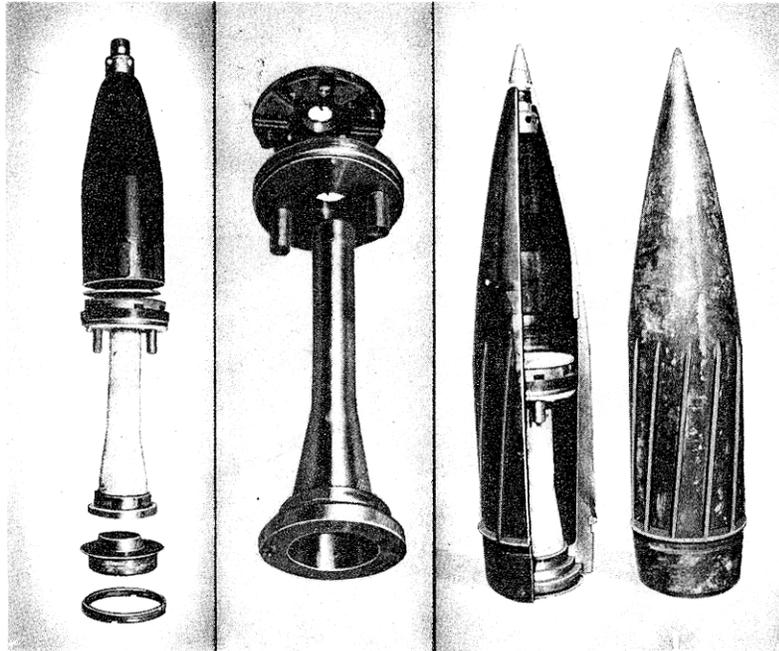
Caliber ..... 280 mm (11.023 ins.)  
 Weight (approx.) ..... 550 lbs.  
 Length (excluding windshield) ..... 33 ins.

## ROCKET ASSISTED PRERIFLED PROJECTILE

GERMAN



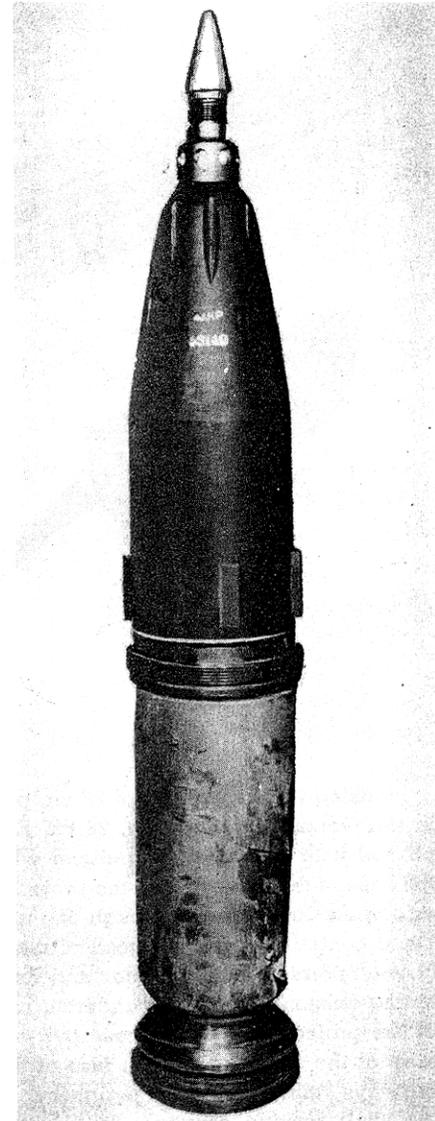
28 cm R. Gr. 4331



Top, left, forward body (ogive) and venturi tube; center, venturi assembly without spun glass sleeve; right, forward body assembled to main body, showing prerifling; at right, assembly with cast explosive charge.

This high explosive projectile is fired from the 28 cm K. 5 (E) railway gun, and is prerifled in the same manner as the 28 cm Gr. 35 described on page 312. The outstanding feature of this new projectile is an increase in range from 67,800 yards to 93,100 yards—nearly 53 miles. This increase of 37% over the maximum range for the standard high explosive round is the result of energy supplied to the projectile by the addition of rocket propellant powder which is ignited 19 seconds after leaving the gun. After building up sufficient pressure to shear the lip on the base plug, the rocket propellant located in the ogive of the projectile discharges through a central venturi tube.

On the main body there are 12 steel splines set at the angle of rifling. The forward body (ogive) is threaded externally to screw into the main body and internally at its nose to receive the fuze and a rocket propellant ignition system. The venturi tube which extends from the base of the projectile to its middle section is secured by being screwed into the fuze and venturi adapter. A spun glass sleeve insulates the venturi tube from the explosive charge which is cast on the resulting assembly. A Zt. Z. S/30 time fuze set to operate 19 seconds after the projectile is fired is screwed into the nose of the projectile. Two percussion fuzes, AZ 4331, are located in the venturi adapter. These are armed by the burning of the rocket propelling charge through a powder pellet incorporated in the fuze. The rocket propellant is moulded as one piece, and extending through it are eight longitudinal holes  $\frac{3}{4}$ -inch in diameter, located around a circular hole  $1\frac{1}{8}$ -inch in diameter.

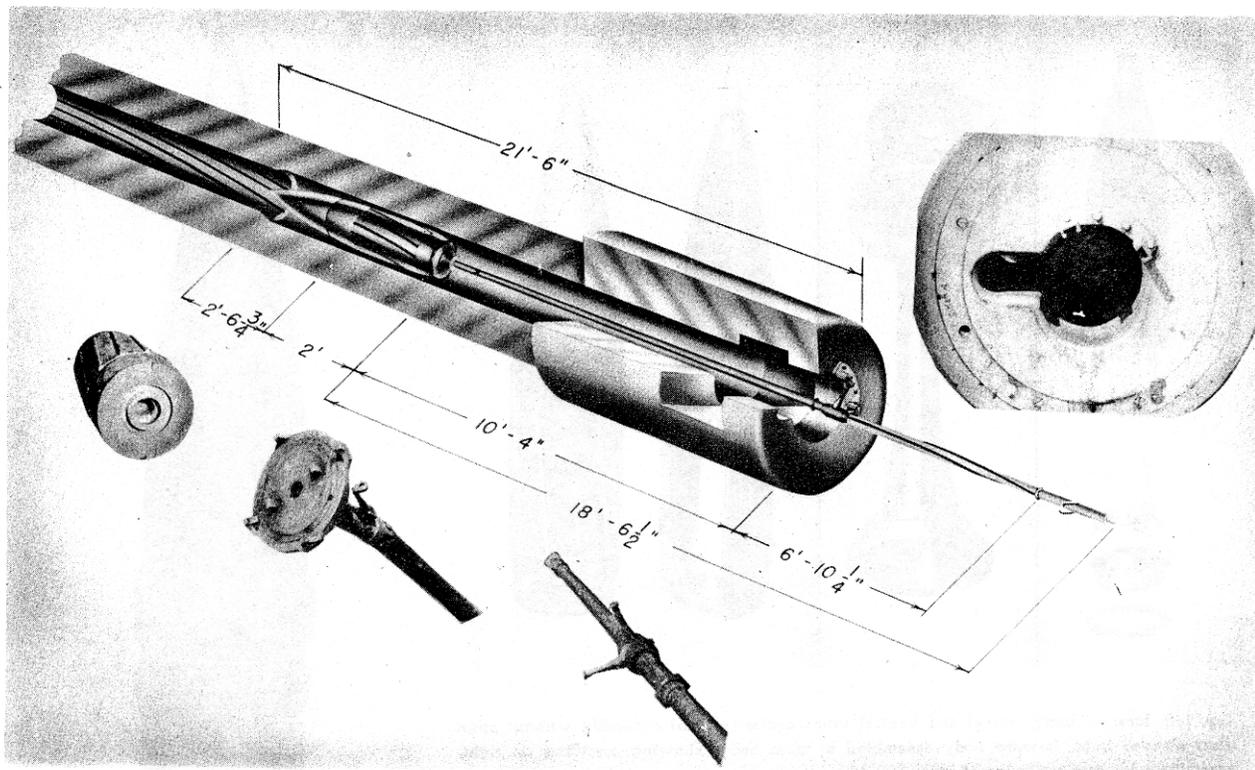


### SPECIFICATIONS

Length of projectile (less fuze) .....	48.79 ins.
Diameter of ribs .....	11.70 ins.
Diameter of rotating band .....	11.85 ins.
Diameter of body .....	11.10 ins.
Total weight .....	545 $\frac{3}{4}$ lbs.
Rocket propellant weight .....	43 lbs.
Explosive weight .....	30 $\frac{3}{4}$ lbs.
Maximum range .....	93,100 yds.

## METHOD OF RAMMING AND INDEXING SPLINED PROJECTILE

GERMAN 



Indexing and ramming the 28 cm prerifled projectile in the German railway gun, 28 cm K5 (E), is accomplished with the aid of the rammer which, by gripping the base of the shell, allows the projectile to be indexed during its final travel through the powder chamber. Fitted centrally in the flat head of the rammer are two claws, reversed to each other and held outwardly by spring tension. A circular undercut recess in the base of the projectile receives these two claws holding the base of the shell against the face of the rammer. Two keyways milled in the periphery of the base of the shell receive corresponding lugs on the face of the rammer and hold the members in rotation. Four evenly spaced lugs projecting longitudinally from the face of the rammer fit over the sides of the base of the projectile and hold the two in a transverse direction.

The head is fitted by a universal joint to the rammer, the front portion of which is a plain two-inch shaft approximately ten feet long and the rear portion machined with four longitudinal splines set at the same angle as the rifling of the tube. Over the splined portion of the rammer, which is 6 feet, 10 $\frac{1}{4}$  inches long, slides a collar fitted with two radially projecting horns set at approximately 75 degrees. The last 16 $\frac{1}{4}$  inches of the rammer are not splined and the extremity threaded, in all proba-

bility to receive a transverse handle. A lever which depresses the claws to release the head from the base of the projectile is fitted to the rear portion of the shaft.

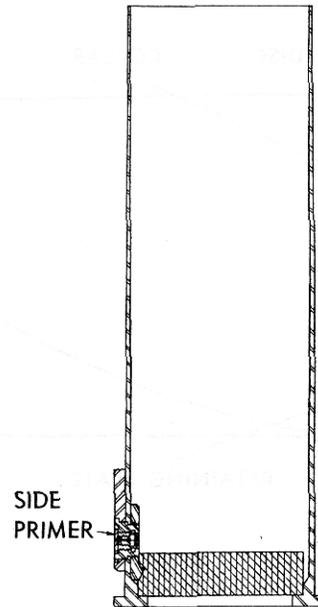
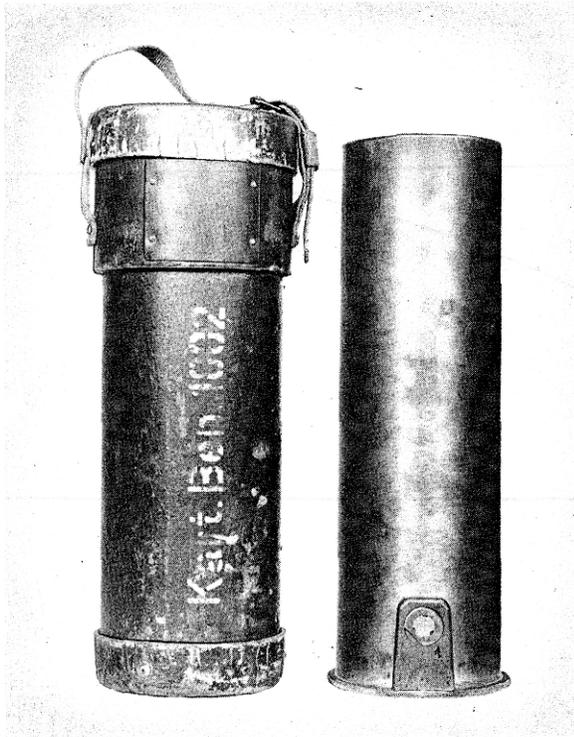
A bracket bolted in the rear face of the breech ring has the function of receiving in two longitudinal keyways, the extremities of the two radial horns of the sliding collar.

In operation, the rammer is held securely to the base of the projectile and the shell is rammed through the powder chamber until the two horns of the sliding collar, in its forward position along the splines, engage in the two matching keyways of the bracket fitted to the rear of the breech ring. At this point, the shell, which still has approximately 2 feet, 6 $\frac{3}{4}$  inches to travel before the leading edge of the splines engage in the grooves of the rifling, is indexed and during the remaining forward travel of ramming remains indexed by virtue of the sliding collar which being held against rotation causes the rammer sliding through it to rotate at the same twist as the rifling.

The position of the two horns can be adjusted in relation to the body of the collar and once set for a particular gun, no further adjustments are necessary. A scale etched on the spline portion of the rammer indicates the depth of ramming from 2,850 to 4,050 centimeters for the 28 cm K5 (E).

# CARTRIDGE CASE FOR 10.5 cm RECOILLESS GUN

GERMAN



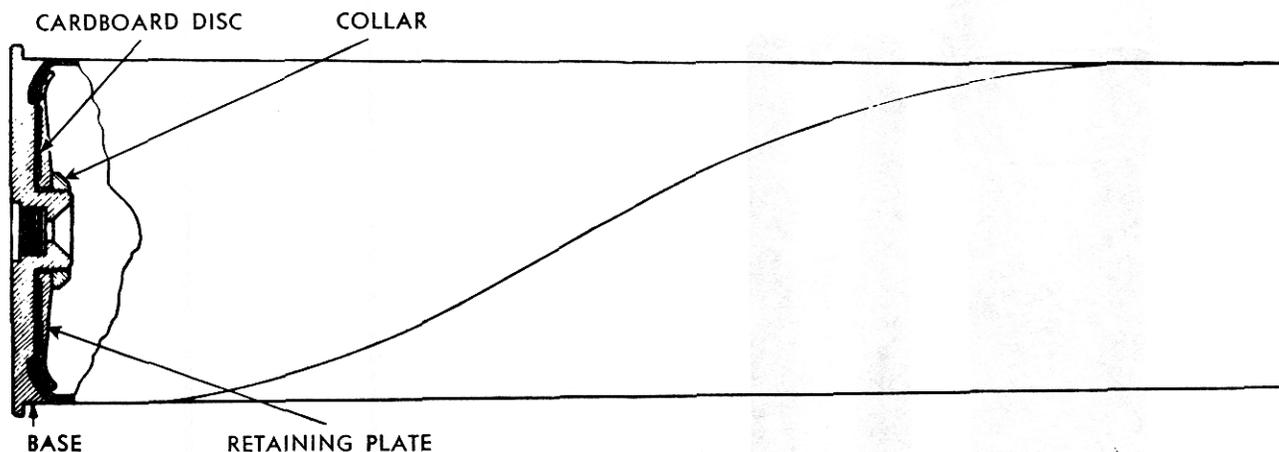
The German Recoilless Gun, versions of which are described on pages 110 and 119, operates without a recoil or counterrecoil mechanism. This is made possible by a design which allows the propelling gases to escape to the rear when the weapon is fired. This unusual design of brass coated steel cartridge case, which makes possible an unexpectedly long range for such a weapon, is provided with a primer in its side and a plastic base insert. This plastic base insert, 1.12 inch thick, momentarily withstands the pressure of the ignited propellant and then disintegrates, being blown out the rear of the weapon along with the released propellant gases.

The propelling charge and igniter are made up to suit side ignition. The propellant is contained in a cylindrical bag; the igniter bag is in the form of a cap, and fits over the end of the propellant bag. The igniter composition is contained in pockets formed between the outer fabric and the lining by quilting the bag. There are twelve pockets around the side and six in the end. The propellant is a flashless composition of the normal "Gudol" type and the igniter composition is the normal porous chopped cord.

## SPECIFICATIONS

Propellant weight .....	6.9 lbs.
Propellant analysis	
Nitrocellulose (N-12.34%) .....	34.47%
Nitroguanidine .....	33.81%
Diethylene Glycol dinitrate .....	30.22%
Graphite .....	0.14%
Potassium Sulphate .....	1.36%
Propellant bag .....	Viscose rayon
Cartridge case.....	Brass coated, 1010 type steel
Thickness of brass coating .....	0.0001 in.
Base insert .....	Phenol-formaldehyde resin

## 17 cm STEEL CARTRIDGE CASE, SPIRAL DESIGN

GERMAN 

This is a large caliber steel cartridge case of different design from those customarily used by the Germans. The body is a wound cylinder made of 0.084 inch thick sheet steel three and four turns thick and turned under at the base to fit into a base assembly. The base assembly is provided with a retaining plate, screwed collar, and a disc which seals the cartridge case and prevents the escape of gases through the base. The disc is of cardboard; all the other parts are of steel.

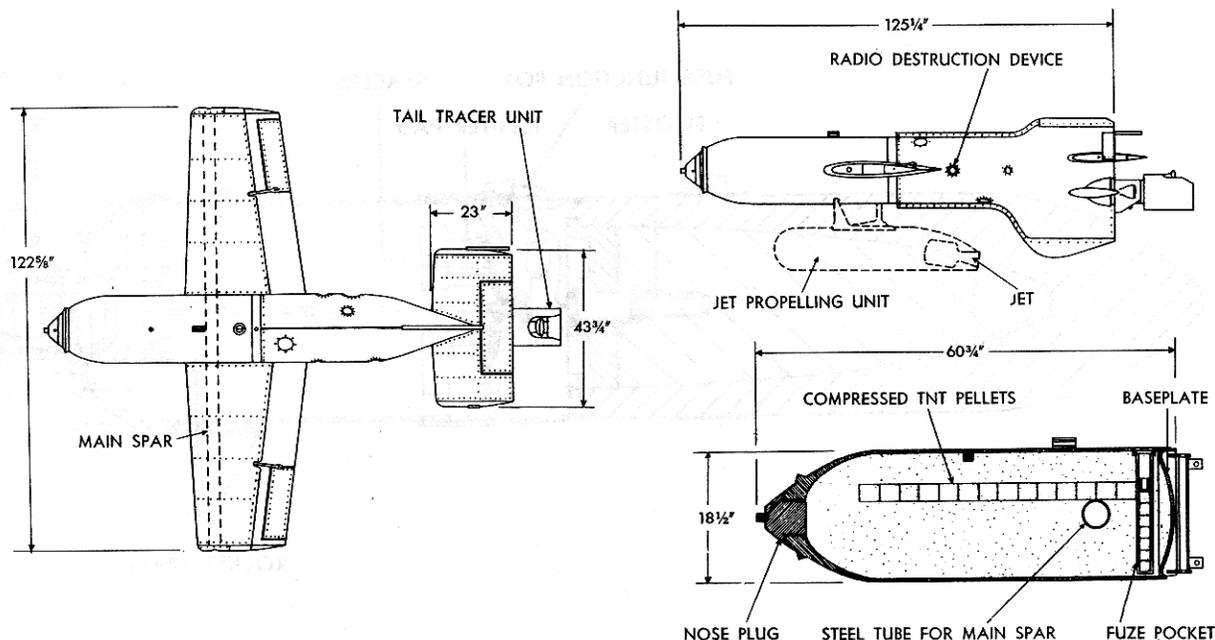
A shallow spiral groove, about 0.003 inch deep and .23 inch wide, is rolled into the inner surface of the body under such pressure as to show the marks of the groove on the outer surface of the case. A layer of black wax is used between the overlapping coils of the body to assist waterproofing. The upper surface of the cardboard disc is also covered with black wax. It appears that this case is manufactured by coiling the sheet approximately to shape, placing the body in a die and rolling to shape with an internal roller. The base, retaining plate, and screwed collar have completely machined surfaces. All the parts have a thin surface film of oxide for protection from corrosion. This is not completely effective.

The Vickers Diamond Hardness of the body increases from about 105 near the base to 133 near the mouth. It is approximately 222 across the base except in the primer boss where it is about 280. On the retaining plate the V. D. H. varies from 160 at the center to 172 on the rim. The screwed collar is 175 V. D. H.

# RADIO-CONTROLLED GLIDER BOMB

H. s. 293

GERMAN 



The German high explosive bomb, H. s. 293, is a radio-controlled, jet-propelled glider, designed primarily for use against merchant ships and naval craft. It is usually released when the plane is in level flight at an altitude of from 3,000 to 5,000 feet, and at a distance of from 3 to 5 miles from the target. However, the bomb is not launched directly at the target, but is released during flight on a course parallel to that of the target. Upon release, the jet propulsion automatically goes into action, and thereafter the flight of the bomb is controlled from the airplane by radio. It is apparently aimed by eye alone and, as an aid to visibility, the tail is provided with flares and an electric lamp for night use.

H. s. 293 is made up of six main parts: the bomb which forms the forward part of the fuselage; the rear portion of the fuselage containing the radio control unit, a gyro, and a destructor; the jet propulsion unit (slung from the base of the bomb); the wings, or planes; the tail plane; and the tail tracer unit. The bomb case is of forged steel and is filled with approximately 600 pounds of 60/40 poured Amatol. A cylinder of compressed T.N.T. pellets lies in this filling, running forward from the fuze pocket. The control unit consists of a radio receiver, a motor generator, and a relay unit. A radio destruction device is located directly under the radio receiver and consists of a small charge with a clockwork fuze.

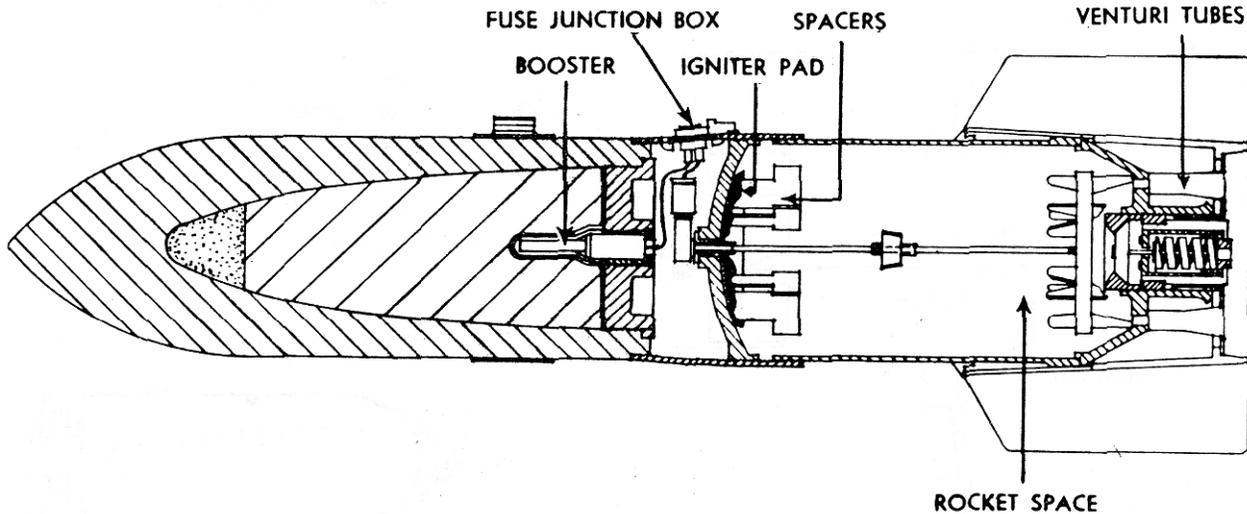
Propulsion is accomplished by means of a bi-liquid rocket unit. Wings and tail planes are of aerofoil section and the skin is of thin sheet alloy. Ailerons are provided for lateral control, and an elevator is concealed in the tail plane. Five flare candles burning consecutively make up the tail tracer unit.

## SPECIFICATIONS

Overall length .....	148 ins.
Length of bomb .....	60 3/4 ins.
Diameter of bomb .....	18 1/2 ins.
Total weight (approx.) .....	1,980 lbs.
Span of mainplanes .....	122 1/2 ins.
Span of tailplanes .....	43 3/4 ins.
Diameter of jet-propulsion unit (approx.) ..	12 ins.
Weight of bomb (approx.) .....	1,320 lbs.
Color .....	Sky-blue

**ROCKET-PROPELLED BOMB**

PC 1000 Rs

GERMAN 

The German 1,000 kg. (actual wt. 2,176 lb.) armor-piercing bomb (PC 1000 Rs) is a rocket-propelled type designed primarily for use against ships or similar targets. The rocket, which is used to increase terminal velocity and armor penetration qualities of the bomb, consist of 19 sticks of propellant contained in a separate compartment at the base of the bomb. Gases generated by the propellant escape from the rocket container through six propulsion venturi tubes which are sealed with pitch until combustion is effected. The compartment is provided with a spring-loaded pressure release valve at the base. It is reported that the minimum height for release is 4,000 ft., and that the rocket burns for approximately three seconds after ignition, leaving a trail of flame 150 ft. long.

The bomb which is filled with alternate layers of good and poor quality TNT, and a very pure cast TNT in an aluminum container in the nose, is fuzed through the baseplate. A charging head, located in a distance piece between the bomb and the rocket container, has a junction box with connections leading to a pyrotechnic and an impact fuze through two pin plugs. These plugs are colored black and red respectively. The pyrotechnic fuze has a 2½-second delay, and consists of an igniter bridge (which functions when an electrical impulse from the charging plate is received at the time of the bomb's release), and a pyrotechnic train calculated to give a safe interval between the time of release and ignition of the rocket element.

The bomb fuze, of the electrical impact type, is also armed by the electrical impulse from the charging head.

There are three other bombs of the same general type: PC 500 Rs; a lighter version of the PC 1000 Rs; PC 1000 Rs Ex, for practice or experimental use (it has no main filling, no baseplate or bomb fuze and the weight is made up by the extra thickness of the bomb casing); and the PC 1800 Rs.

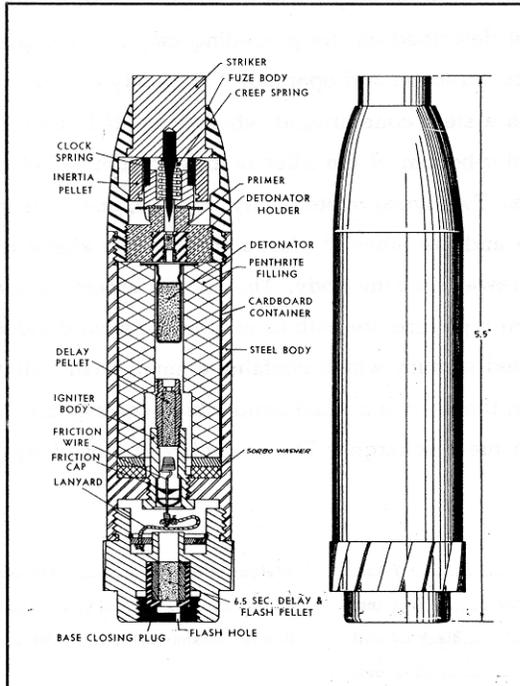
**SPECIFICATIONS**

Total weight .....	2,176 lbs.
Weight of case .....	1,470 lbs.
Weight of explosive .....	119 lbs.
Overall length .....	7 ft. 2¾ ins.
Length of bomb .....	3 ft. 9 ins.
Diameter of bomb .....	1 ft. 3½ ins.
Diameter of tail fins	
Large .....	2 ft. 4 ins.
Small .....	1 ft. 10 ins.
Dimensions of Propellant	
6.....	22½ ins. long x 2 15/16 ins. diameter
12.....	20¾ ins. long x 2 15/16 ins. diameter
1.....	11¼ ins. long x 2 15/16 ins. diameter
Filling .....	T.N.T.
Color .....	Sky-blue

## ANTIPERSONNEL RIFLE OR HAND GRENADE

GERMAN 

Gewehr-Sprenggranate



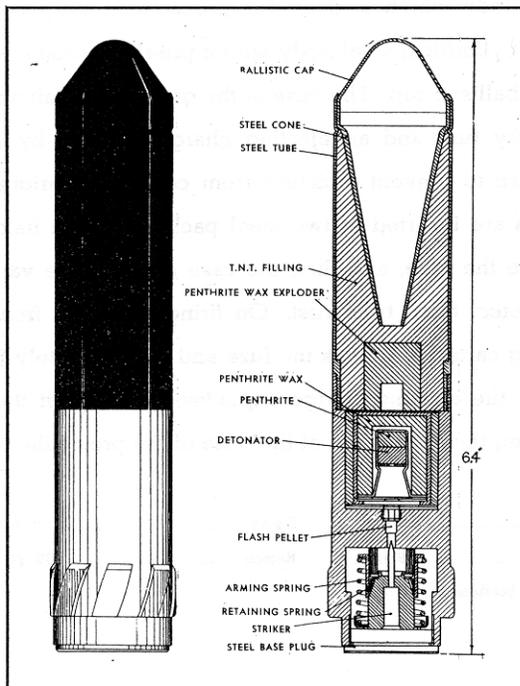
This grenade consists of a tubular steel body containing an explosive filler of penthrite wax, a detonator, a direct action nose fuze, a delay friction igniter, and a base assembly containing a self-destructing system. A diaphragm near the bottom of the grenade is threaded centrally to receive the friction igniter. The fuze and base assemblies are not integral parts of the grenade, but are screwed into the nose and base respectively. If the nose fuze does not function properly, the grenade is self-destructive. On firing, the flash from the propelling cartridge enters a hole in the base closing plug and ignites a 6.5 second delay pellet contained in a brass holder. This fires the friction igniter which gives an additional delay of 4.5 seconds before setting off the detonator. The grenade may also be used as a hand grenade by removing the base assembly and pulling a cord attached to the friction igniter.

Overall length ..... 5.5 ins.  
 Maximum diameter ..... 1.2 ins.  
 Color.....Black body; aluminium fuze and base  
 Total weight ..... 9 ozs.

Explosive filler .....PETN/Wax  
 Weight of filler ..... 1.1 oz.  
 Maximum range ..... 550 yds.  
 Delay .....Self-destructing—11 sec.  
 Friction igniter—4.5 sec.  
 Impact—no delay

## ANTITANK RIFLE GRENADE

Gewehr Panzergranate



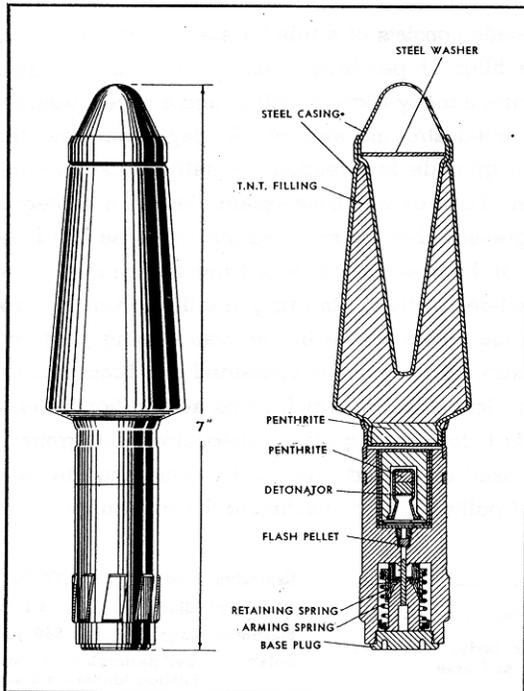
The Gewehr Panzergranate is constructed in two parts, the head and the stem. The head, a seamless steel tube fitted with a light ballistic cap, contains a hollow charge cone and an explosive filling of T.N.T. A cavity is provided in the rear portion of the main filling to take an exploder of penthrite wax. The stem of light alloy or aluminum is screwed onto the head of the grenade. It is divided into two compartments. The upper portion contains the booster which consists of a detonator surrounded by a penthrite wax filling contained in a light alloy case. The percussion type fuze is located in the lower part of the stem. In the septum is a small flash pellet held in place by a perforated screw plug. A pre-engraved driving band is formed on the outside of the grenade approximately  $\frac{1}{4}$  inch from the base. The entire assembly is closed by a base plug which positions the fuze by a stem which fits into a recess in the rear of the striker body.

Overall length ..... 6.4 ins.  
 Maximum diameter .....  $1\frac{3}{16}$  ins.  
 Color....Black body; aluminum stem  
 Total weight ..... 8.8 ozs.

Filler .....T.N.T./Cyclonite  
 Weight of filler..... 1.75 ozs.  
 Range ..... 50 yds.

**H.E.A.T. (Hollow Charge) RIFLE GRENADE**GERMAN 

Gross Gewehr Panzergranate

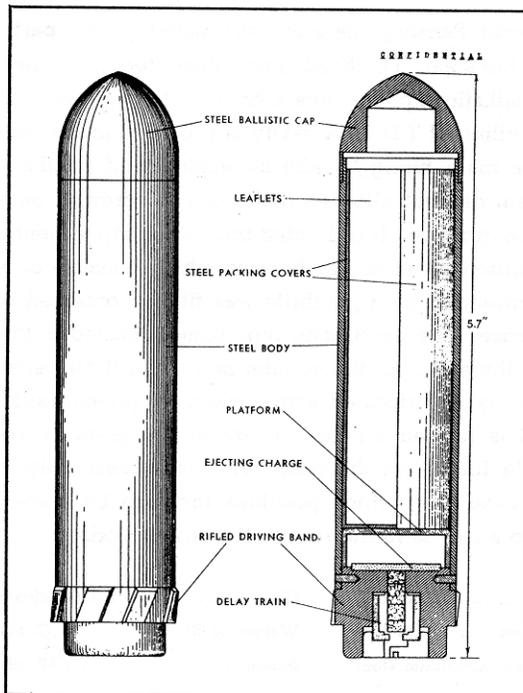


This grenade, while larger and of slightly different contour than that described on the preceding page, is basically the same in construction and operation. The body of pressed steel contains a steel cone around which the T.N.T. filler is cast, and at the bottom of the filler is an exploder pellet of penthrite wax. Two types of stem may be used, one entirely of light alloy and the other of plastic with a steel shank by which it is screwed onto the body. The booster assembly and the percussion type fuze are both located in the stem divided by a perforated septum which contains a small flash pellet. At the base of the stem is a rifled band which corresponds to the rifling on the discharger. The assembly is closed by a base plug.

Overall length .....	7 ins.	Weight of filler.....	4½ ozs.
Maximum diameter .....	1¾ ins.	Filler .....	T.N.T./Cyclonite
Color .....	Black overall	Range (maximum) .....	100 yds.
Total weight .....	13½ ozs.		

**PROPAGANDA RIFLE GRENADE**

Gewehr Propaganda Granate



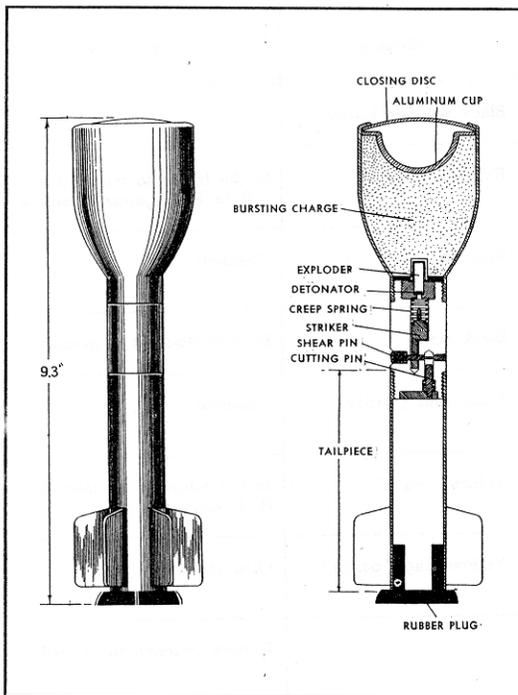
This grenade which is used for propaganda purposes consists of a cylindrical steel body with a pre-rifled base and a removable ballistic cap. The base of the grenade contains a 9-second delay fuze and an ejecting charge covered by a cardboard disc to prevent moisture from causing deterioration. Leaflets are inserted in two steel packing covers held loosely inside the case, and then the case and cap are varnished to protect them from rust. On firing, the flash from the propelling cartridge ignites the fuze and approximately 9 seconds later the ejecting charge explodes, blowing off the cap and forcing the leaflets out of the nose of the projectile.

Overall length .....	5.7 ins.	Delay .....	9 sec.
Total weight .....	8 ozs.	Range .....	500 yds.
Weight without leaflets.....	7 ozs.		

## H.E.A.T. (Hollow Charge) GRENADE

Schuss Gr. P-40

GERMAN 

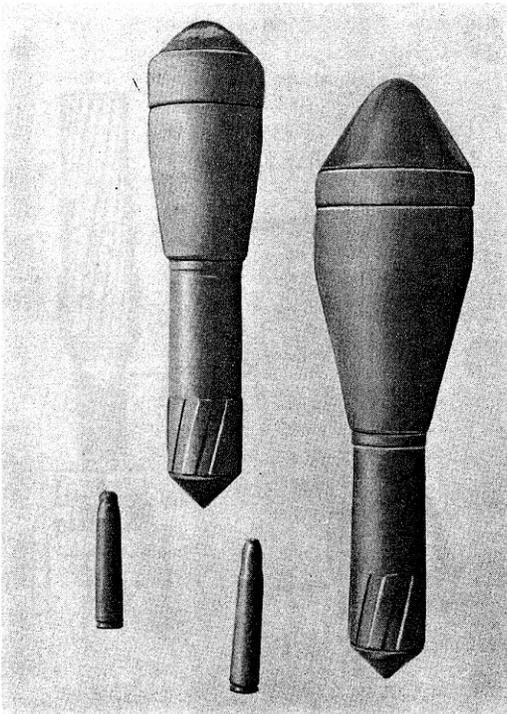


This grenade consists of a bell-shaped body of thin steel with a slightly convex aluminum closing disc, a graze fuze which screws into a cylindrical projection welded to the base of the body, and a finned tail unit. The bursting charge of cyclonite wax is cast around an aluminum hollow charge liner which is hemispherical in shape. A detonator and intermediary exploder are contained in an aluminum magazine which fits into the base of the main explosive cavity. The tail unit screws onto the base of the fuze housing and consists of a drawn-steel tube with six vanes formed in pairs. The cartridge is of the 7.92 mm small arm type with an undyed hollow wooden bullet.

Overall length .....	9.3 ins.	Markings.....	Blue band round projection at base of body
Maximum diameter .....	2.4 ins.	Length of body .....	3.1 ins.
Color .....	Olive green	Filler .....	Cyclonite/Wax

## H.E.A.T. (Hollow Charge) RIFLE GRENADE

Gross Panzergranate 61 and 46



Two additional H.E.A.T. (hollow charge) armor piercing rifle grenades have recently been recovered and are illustrated herewith. They bear the designations G. Pz. Gr. 61 and G. Pz. Gr. 46. The numerals "61" and "46" refer to the diameter of the explosive head in millimeters. The maximum range of the "61" is 218 yards. Static fired at normal, the "61" is reported to penetrate to 4.96 inches of homogeneous armor plate; the "46" is reported to penetrate 3.54 inches of the same plate.

"61"	"46"		
Total weight .....	1 lb., 4.25 ozs.	Total weight .....	14.65 ozs.
Weight of H. E. filling.....	8.69 ozs.	Weight of H. E. filling....	5.16 ozs.
Weight of booster explosive	.24 oz.	Weight of booster explosive	.24 oz.
Weight of propelling cartridge powder .....	27 grains	Weight of propelling cartridge powder .....	27 grains

RESTRICTED

OFFICE CHIEF  OF ORDNANCE

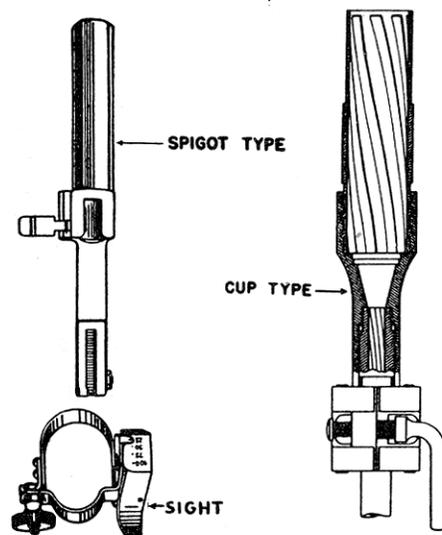
# GERMAN RIFLE GRENADE PROPELLING CARTRIDGES

GERMAN 

Cartridge for	German Name	Powder Filling Nz. T. P. (1.4;2:0.5/0:25) grams	Markings	Remarks
Large A. P. Grenade	G. Treib. Patr. für Gr. G. Pzgr.	1.9	Black wooden bullet	
Propaganda Grenade	G. Kart. für G. Propgr.	1.7	Red ring	In the future to be used only for Rifle Propaganda Grenade
Propaganda Grenade (Old Type)	G. Kart. (Alter Art) für G. Propgr.	1.7	Red ring	Obsolete
Small A. P. Grenade	G. Kart. für G. Pzgr.	1.1	Black ring	Packed attached to grenade
Small A. P. Grenade	G. Kart. (Alter Art) für G. Pzgr.	1.1	Black ring (partly)	Obsolete
H. E. Grenade	G. Kart. für G. Sprgr.	1.0	Yellow ring	In the future to be used only for H. E. grenade
H. E. Grenade	G. Kart. (Alter Art) für G. Sprgr.	1.0	Yellow ring (partly)	Obsolete
H. E. Grenade (Old Type)	G. Kart. (Alter Art) für G. Sprgr.	0.85		Packed attached to grenade

## RIFLE DISCHARGERS

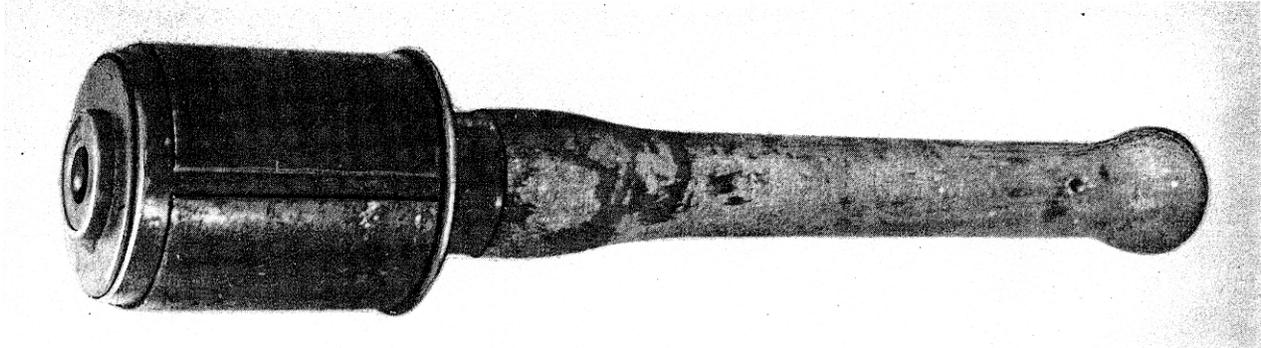
The two standard German rifle dischargers are the cup type (Schiebsbecher) and the spigot type. The former is made of steel and consists of a rifled barrel which screws into a holder fitted with a clamp for attaching it to the rifle barrel. There are no gas ports, and varying ranges are obtained by altering the elevation of the rifle by the aid of the sighting attachment. The latter type consists of a hollow tubular spigot about one inch in diameter, terminating in a part resembling the hilt of a bayonet. It is fitted to the rifle in the same manner as a bayonet, and is locked in position by a spring-loaded bolt. The hollow tailpiece of the grenade is fitted over the spigot, and on firing the propelling cartridge, the gasses pass out of the barrel of the rifle through the spigot and into the hollow tailpiece to propel the grenade. Both a swing-over blade front sight and a rear sight are provided.



## NEW TYPE STICK HAND GRENADE

GERMAN 

Stielhandgranate 43

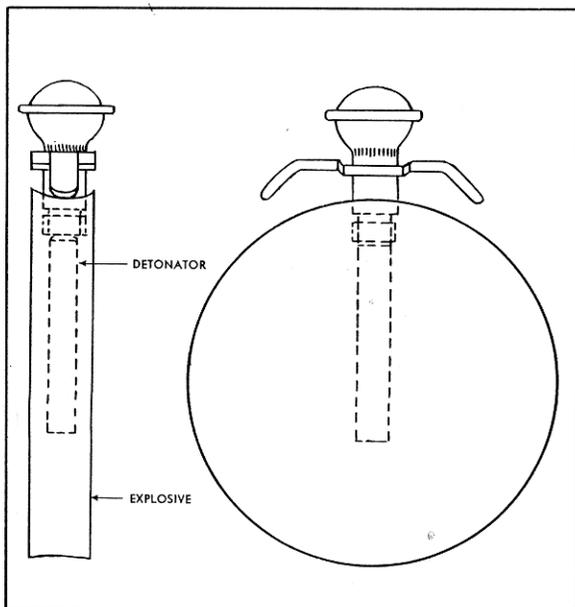


The new type German Stick Grenade, consisting of a head filled with TNT, a smooth fragmentation sleeve, fitted over the head, and a detachable wooden handle, is a modification of the standard Stielhandgranate 24 described on page 321.

The later model, however, does not have a friction

igniter operated by a cord running through the handle. Instead, the detonator and 4½-second delay igniter similar to that used with the egg grenade, are screwed into the top of the explosive head. The grenade may be thrown with or without the handle. Arming and priming are the same as for the egg grenade.

## OFFENSIVE DISC TYPE GRENADE



This grenade, a new type of offensive weapon, has no outer casing or cover, but consists merely of a disc cut from a pre-cast or pressed pellet of explosive, and an igniter. The disc, which is believed to be R.D.X./wax, is 3 5/16 inches in diameter and 17/32 inches thick. It is drilled to receive the igniter and detonator.

A standard friction igniter with a delay of approximately six seconds, and a detonator (Sprengkapsel 08) are used.

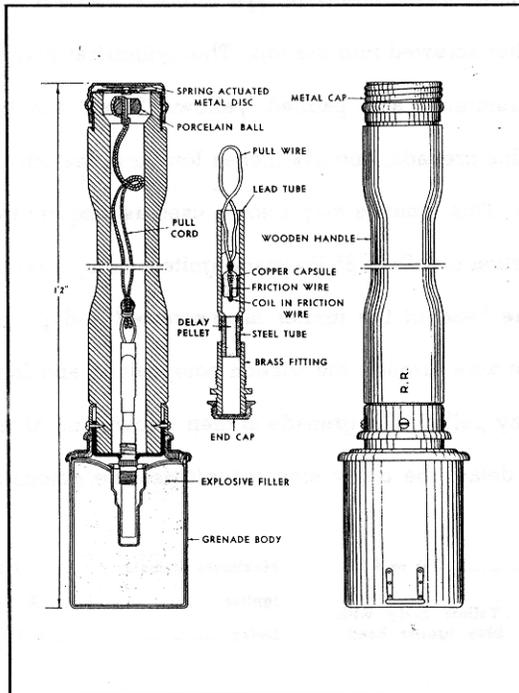
### SPECIFICATIONS

Diameter of disc .....	3 5/16 ins.
Thickness of disc .....	17/32 in.
Explosive .....	R.D.X./wax
Color .....	Chocolate

## STICK HAND GRENADE MODELS 24 AND 39

GERMAN 

Stielhandgranaten 24 u. 39



The head of this grenade is a thin steel casing containing the explosive filler. This is screwed onto a hollow wooden handle through the center of which runs a double length of cord. This cord connects at the forward end to a friction pull igniter (B. Z. 24) and at the rear to a porcelain ball in a metal cap. In operation, the cap is removed, the porcelain ball pulled, and the missile thrown to detonate after a 4-5 second delay.

### MODEL 24

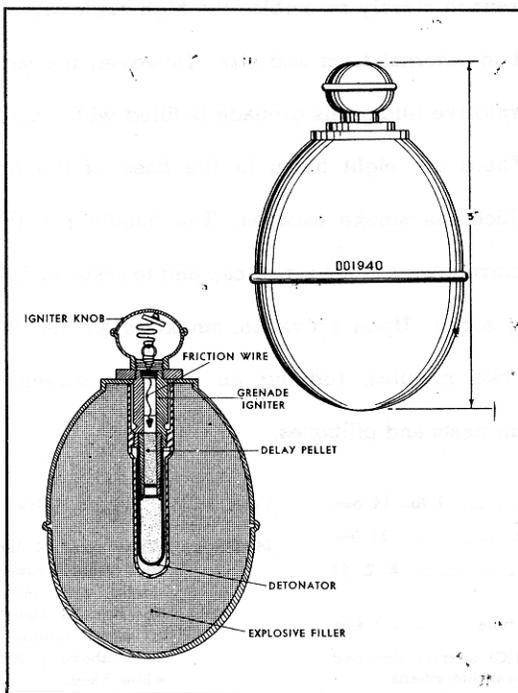
Overall length ..... 1 ft., 2 ins.  
 Diameter of body ..... 2¾ ins.  
 Color of body ..... Olive drab  
 Weight ..... 1 lb., 5 oz.  
 Weight of explosive filler... 6 ozs.  
 Explosive filler ..... T.N.T.  
 Igniter ..... B. Z. 24  
 Delay ..... 4-5 sec.

### MODEL 39

Overall length ..... 1 ft., 4 ins.  
 Color ..... Olive drab  
 Weight ..... 1 lb., 6 ozs.  
 Weight of explosive filler... 7 ozs.  
 Igniter ..... B. Z. 24  
 Delay ..... 4-5 sec.

## EGG-TYPE HAND GRENADE MODEL 39

Eierhandgranate 39

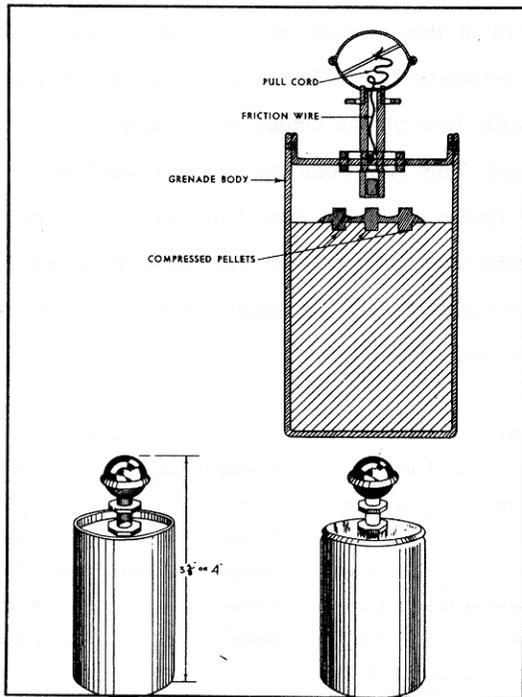


This grenade consists of a thin egg-shaped case filled with an explosive charge, and a friction type igniter with a delay pellet. The upper end of the friction wire in the igniter is attached to a disc in the head which screws on to the top of the body. In operation, the head is unscrewed and pulled, drawing the wire through the friction composition and igniting the delay pellet. After a delay of from 4 to 5 seconds the pellet initiates the detonator which in turn sets off the explosive filler.

This type hand grenade has been used as a booby trap by fitting a non-delay friction igniter which can be identified by its left-hand threads.

Overall length ..... 3 ins.  
 Maximum diameter ..... 2 ins.  
 Color..... Black body with blue igniter head  
 Weight of explosive filler 3.85 oz.  
 Weight ..... 12 ozs.  
 Igniter ..... B. Z. 39  
 Delay ..... 4-5 sec.

# SHAVING STICK GRENADE

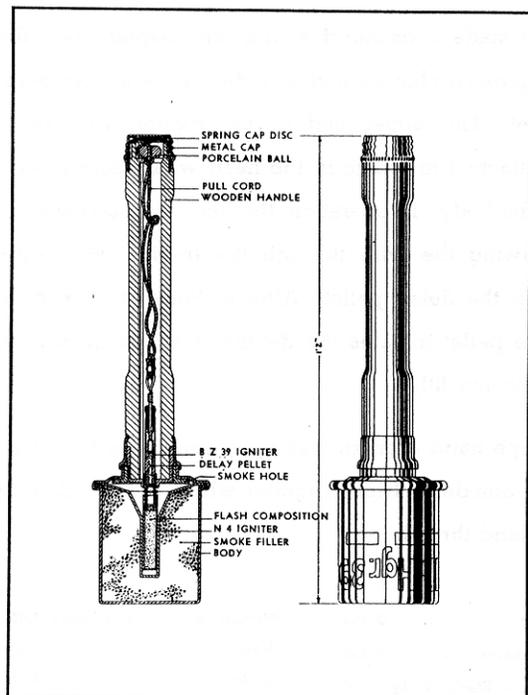


This is a thin-cased offensive type grenade with a B. Z. E. friction igniter screwed into the top. The cylindrical body is made of aluminum and painted yellow. There are two models of this grenade, one 3<sup>3</sup>/<sub>8</sub> inches long and the other 4 inches long. This grenade may also be used as a booby trap by the insertion of a D. Z. 35 Pressure Igniter. To operate the grenade, the head of the igniter is unscrewed and pulled, drawing the wire through the friction composition and igniting the delay pellet. The grenade is then thrown and after a 4-5 second delay, the delay element initiates the detonator.

Overall length.....	3 <sup>3</sup> / <sub>8</sub> or 4 ins.	Maximum diameter .....	2 ins.
Color.....	Yellow body with blue igniter head	Igniter .....	B. Z. E.
		Delay .....	4-5 sec.

# SMOKE HAND GRENADE 39

Nebelhandgranate 39



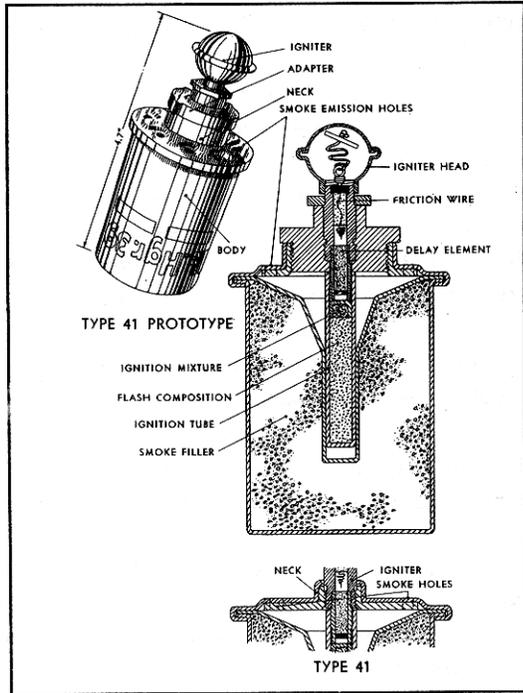
This grenade closely resembles the high explosive stick grenade 24 in external form and size. However, instead of the high explosive filling this grenade is filled with a smoke mixture. There are eight holes in the base of the head through which the smoke escapes. The handle has three horizontal corrugations at the screw cap end to assist in differentiation by touch. Upon activation, smoke is emitted for a period of two minutes, forming an effective screen for machine gun nests and pillboxes.

Total weight .....	1 lb., 14 ozs.	Color .....	Olive drab
Overall length .....	14 ins.	Markings.....	White band 8 inches wide around center of handle and lettering Nb. Hgr. 39 stencilled in white around the body above a broken white band.
Igniter .....	B. Z. 39		
Delay			
N4 ignition tube .....	7 sec.		
Filling.....	(HC) mixture zinc and hexachlorethane		

# SMOKE HAND GRENADE 41 AND PROTOTYPE



## Nebelhandgranate 41

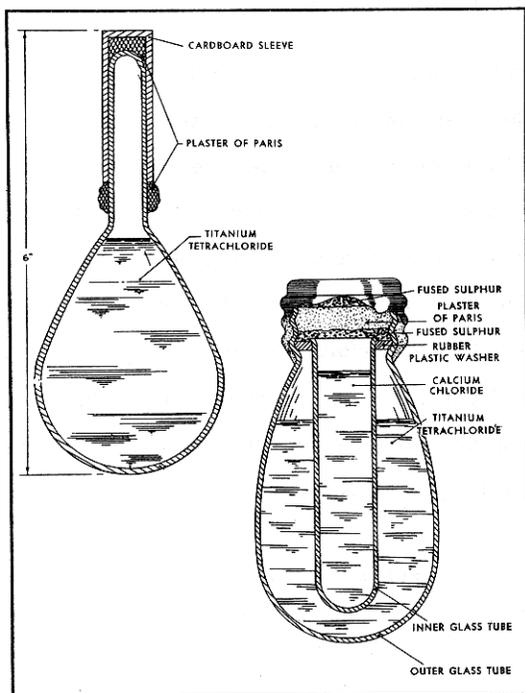


The prototype of this grenade is comprised of the body of the smoke hand grenade 39 with a synthetic resin adapter to hold the B. Z. E. igniter. The Model 41 is of similar construction but the body has been modified so that the igniter fits into a small central neck without the use of an adapter. There are only two smoke holes instead of eight. The friction igniter operates with a 4-5 second delay, setting off a 2-minute smoke discharge.

Overall length .....	4.7 ins.	Filling.....(HC) type mixture. Zinc and Hexachlorethane		
Maximum diameter .....	2.3 ins.	Igniter .....	B. Z. E.	
Color .....	Olive drab	Delay	N4 Ignition tube .....	4-5 sec.
Total weight .....	21 ozs.			

# SMOKE GRENADES

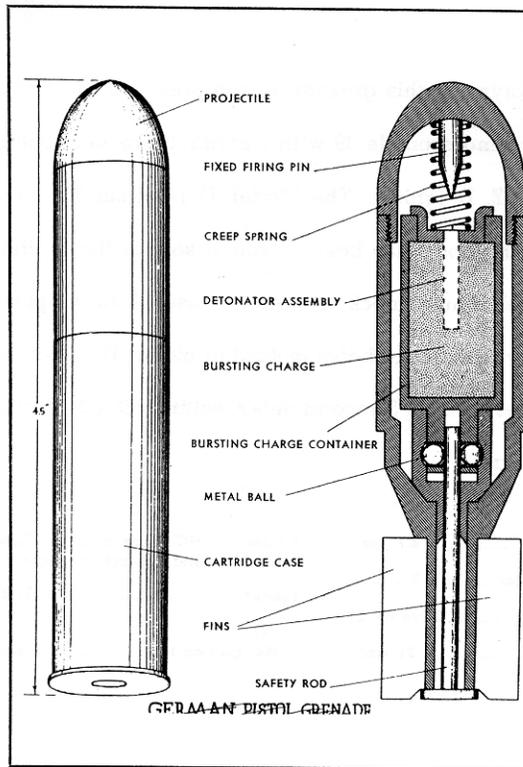
## Blendkörper 1H u. 2H



These grenades are made in the form of glass flasks. Model 1H is a single container; Model 2H includes an inner glass tube filled with a solution of calcium chloride. The body of each grenade is filled with titanium tetrachloride which vaporizes upon contact with the air. The calcium chloride permits the second model to operate at low relative humidity, whereas the first model produces a thin fog unless the air is quite moist. Both models discharge upon impact with any hard object.

1H	2H		
Overall length .....	6 ins.	Overall length .....	4.8 ins.
Maximum diameter .....	2½ ins.	Maximum diameter .....	2½ ins.
Total weight .....	13.2 ozs.	Total weight .....	17 ozs.
Filling.....	(FM) Titanium Tetrachloride	Filling & filling weight	
Weight of filling.....	10.6 ozs.	Outer flask.....	10 oz. titanium tetrachloride
		Inner flask.....	1.3 oz. aqueous solution of calcium chloride

**AMMUNITION for 27 mm SIGNAL PISTOL**

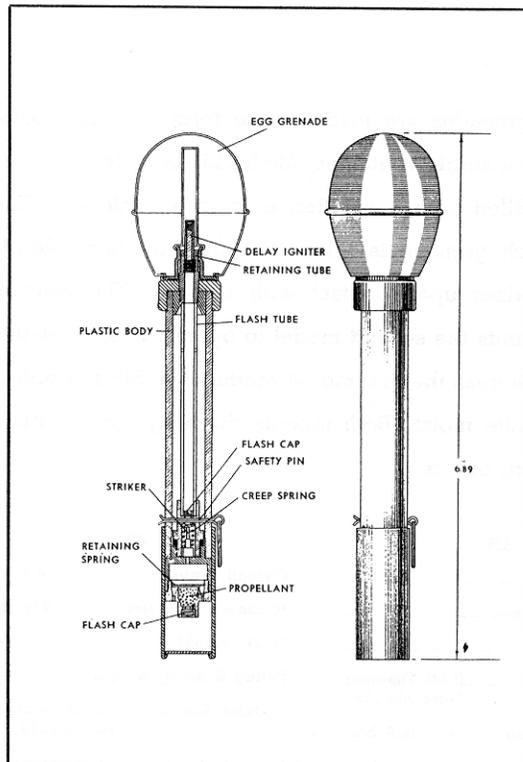


**PISTOL GRENADE**

26 mm Wurfgranate Patrone 326 Leuchtpistole

This grenade, consisting of a rounded nose cap screwed to a cylindrical body, is equipped with four fins which are fixed to the base of the body. A brass or aluminum cartridge crimped to the grenade completes the assembly. A case containing the detonator and main filling is separated from a fixed firing pin in the nose of the grenade by a creep spring. The case is prevented from moving forward before firing by two metal balls in the base of the carrier. An arming rod inserted between the two balls prevents them from moving. This is forced out of the base by setback about ten or twelve yards after the grenade leaves the muzzle of the gun. The balls then slide out of their grooves and the case is free to move against the firing pin, exploding the grenade on impact.

Overall length .....	4.5 ins.	Weight of projectile.....	3.2 ozs.
Maximum diameter .....	1 in.	Filler .....	T.N.T.
Color .....	Yellow	Weight of filler .....	0.25 oz.
Weight of complete round	4.2 ozs.		



**PISTOL GRENADE**

Wurfkörper Leuchtpistole

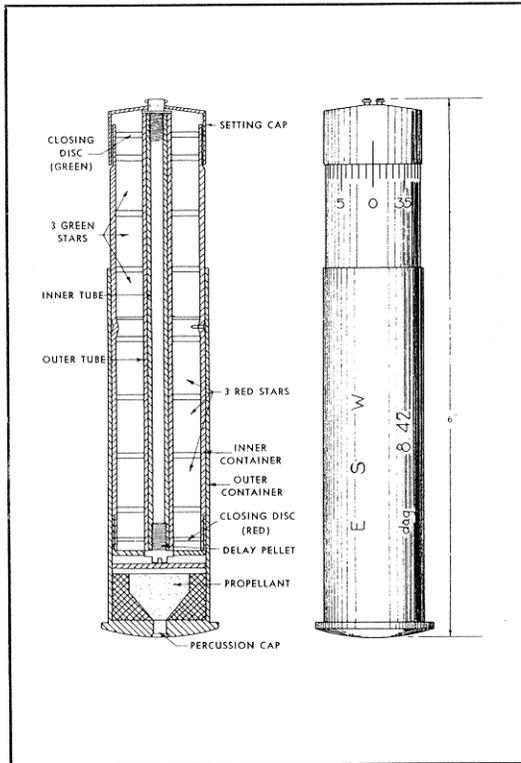
This pistol grenade is formed by adding to the egg-type hand grenade (Eierhandgranate 39) a plastic stem to which it is attached by a retaining tube. The tube contains the delay igniter at the forward end inside the grenade. An alloy flash tube connects this to the fuze which is located in the base of the stem. The fuze is separated from the primer by a safety pin which is pulled out before the grenade is placed in the pistol barrel. Upon firing, the firing pin strikes the primer which sets off the delay igniter, detonating the explosive charge after a delay of 4.5 seconds.

Overall length .....	6.89 ins.	Delay .....	4.5 sec.
Maximum diameter .....	3 ins.	Range .....	80 yds.
Color .....	Olive green		

**AMMUNITION for 27 mm SIGNAL PISTOL**



**27 mm MULTI-STAR SIGNAL CARTRIDGE**



The cartridge consists of a light alloy outer container complete with the propelling charge and an inner container in which there are six star units. Running through the center of the star units is an assembly of two brass tubes with selector holes for the six choices of settings. The inner tube contains gunpowder and is closed by a plug which contains a delay pellet. In firing, the inner container is propelled and after the delay pellet has burned through, the flash passes immediately along the whole length of the inner tube, igniting and ejecting the stars in accordance with the setting.

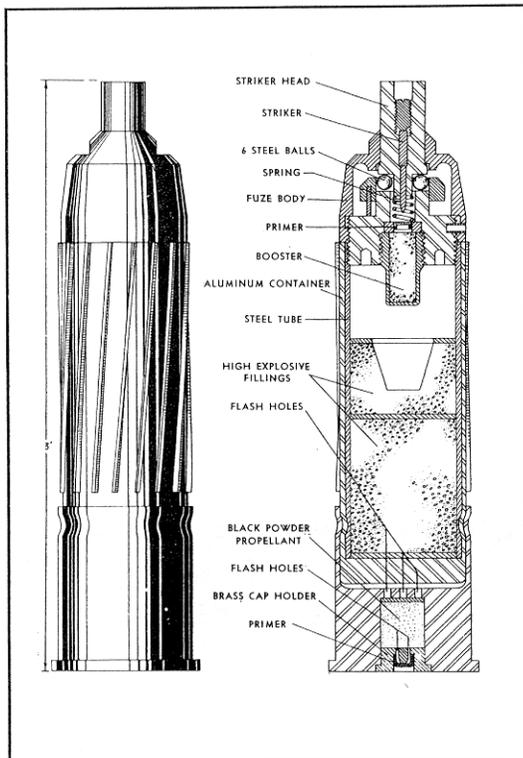
Overall length ..... 5¾ ins.      Filling.....Propellant & pyrotechnic  
 Maximum diameter ..... 1.06 ins.

Star combinations and dial settings:

3 red	1 red	3 red	1 red	2 red	2 red
3 green	2 green	1 green	3 green	2 green	1 green
(0-2)	(7-8)	(14-15)	(21-22)	(27-29)	(34-35)

**H. E. CARTRIDGE FOR 27 mm GRENADE PISTOL**

**Sprengpatrone für Kampfpistole**



This grenade consists of a die cast aluminum container which encases a steel tube containing the explosive charge. Into the steel tube is screwed a direct action nose fuze with a protruding striker head. The striker is held away from the detonator by six steel balls kept in position by a steel collar supported on three aluminum pins. The creep spring separates the striker and primer beneath which is a booster separated from the main filling by an empty air space. The black powder propelling charge is contained in a cup with a lead Styphnate primer. The grenade has grooves on the aluminum body fitting the rifling of the Kampfpistole from which it is discharged.

Overall length ..... 3 ins.      Filler .....PETN/Wax  
 Color .....Unpainted aluminum      Weight of filler ..... .77 oz.  
 Weight of complete round.... 5 ozs.      Propellant..Graphited black powder  
 Weight of projectile ..... 3½ ozs.

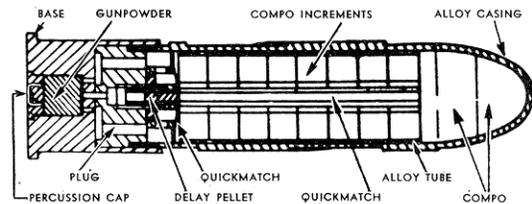
## MISCELLANEOUS PISTOL GRENADES

GERMAN 

### SMOKE

#### Nebelpatrone für Kampfpistole

This grenade is similar in appearance and construction to the high explosive grenade except that it contains a smoke generator instead of an explosive filler. It is fitted with a percussion type nose fuze which has a charge of gunpowder located just below the flash cap instead of a detonator. The projectile functions on impact and the gunpowder, ignited by the flash cap, ejects the smoke generator from the body of the grenade and at the same time ignites it. The projectile may be recognized by the following stencilled marking on the base of the cartridge case: NEBEL. Z.



### INDICATOR

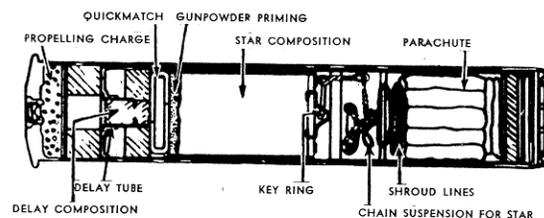
#### Deutpatrone für Kampfpistole

The indicator grenade is similar externally to the smoke and high explosive grenades except for the head which is parabolic. There is no fuze. The smoke train, a puff of reddish-brown smoke, is fired by the flash from the propellant. The indicator system begins to function when the projectile has been in flight for about two seconds. The weight of the complete round is 4.5 ounces; that of the grenade itself, 3 ounces. The marking on the base of the cartridge case is: DEUT. Z.

### ILLUMINATING STAR ON PARACHUTE

#### Fallschirm Leuchtpatrone für Kampfpistole

This type grenade has the same general contours as the two others previously described. It has a black bakelite head and a screwed-on base plug which is perforated to hold a gunpowder pellet. Inside the grenade, directly above the plug is an illuminating star to which a parachute is attached. On firing, the flash from the propellant ignites the gunpowder pellet, which, after a brief delay, ignites the star. The bakelite head is blown off, and the star ejected. The grenade may be identified by the stencilling "F. Leucht. Z." on the base of the cartridge case.



## ROCKET PROJECTOR

28/32 cm Nebelwerfer 41

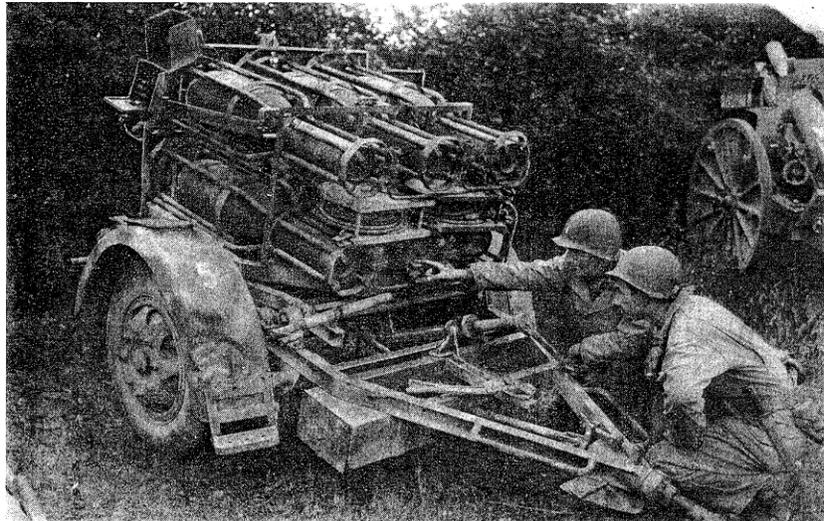
GERMAN



This rocket projector fires the 28 cm high explosive rocket (page 354) and the 32 cm incendiary rocket (page 353). Ranges are given below.

This device, which functionally does not differ from the 15 cm and 21 cm Nebelwerfers, consists of six projectors grouped in two tiers of three each, mounted on a two-wheel trailer. The cages are constructed of round steel bars shaped to the outside contours of the 32 cm rocket. Detachable liners for the forward end of the projectors permit the use of 28 cm rockets. The portion of the projector holding the propelling chamber remains the same for both rounds.

The firing mechanism is electric. Traverse (approximately 30°) and elevation (from 0 to 45°) are by means of cranks.



The piece is fired from its mounting and is held in position by two jacks in front and a small spadelike

arrangement in the rear.

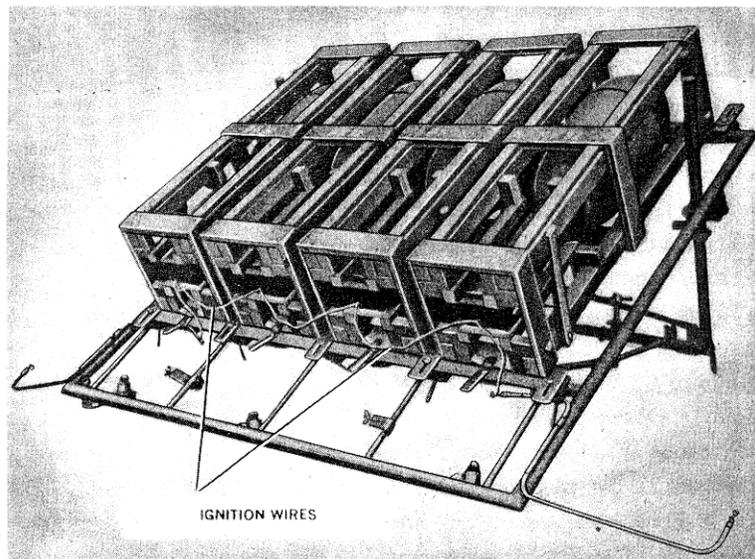
The equipment weighs approximately 2,460 lbs.

## TRANSPORTABLE ROCKET PROJECTORS

28/32 cm schweres Wurfgerät 40 and 41

These two rocket projectors, or ramps, differ from each other only in construction details and in the material used. The Schweres Wurfgerät 40 is made of wood and weighs 115 pounds; the 41 model is of metal, weighing 243 pounds. Each is designed to carry four crates of the 32 cm incendiary rocket (page 353) or the 28 cm high explosive rocket (page 354).

Either model is adjustable for elevation. Firing is accomplished by the hand electric firing system pro-



vided for the crates themselves. Maximum ranges for these projectors are identical: 2,106 yards for

the 28cm Wurfkörper Spr. and 2,406 yards for the 32 cm Wurfkörper M. Fl. 50.

## ROCKET PROJECTORS ON SEMITRACK VEHICLES

### Schweres Wurfrahmen 40

This rocket projector is designed for use on half-tracked armored personnel carriers. The principal feature of the device is the carrier plate, three of which are mounted on each side of the half-track. Each is adjustable for elevation of 5° to 45°, and is believed to be equipped with an elevating scale. The actual projector consists of the crate in which the 28 cm or 32 cm rocket is packed, and which may be secured to the plates. Reports indicate that each vehicle carries six rounds, five of which are 28 cm high explosive and one 32 cm incendiary. Range figures are identical to those applying to the



Schweres Wurfgerät 40 and 41 and the 28/32 cm Nebelwerfer 41.

The photos above show the 3-ton

armored semi-track (m. gp. Zgkw.) fitted with rocket projectors as described above.

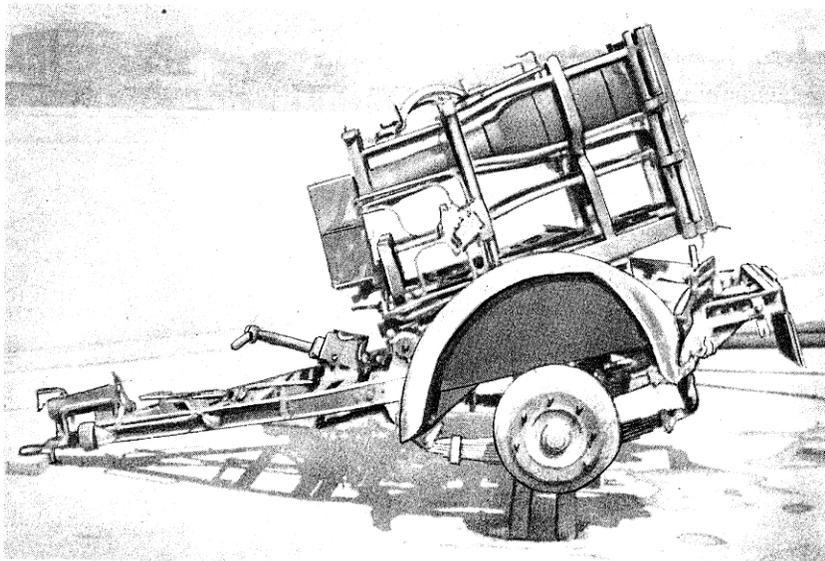
## ROCKET PROJECTOR

### 30 cm Nebelwerfer 42

This rocket projector very closely resembles the 28/32 cm Nebelwerfer 41. The individual projectors are of similar construction, each one being shaped to the contours of the standard 30 cm rocket ammunition. The rear portion, however, is considerably larger than that of the 28/32 cm projector to accommodate the larger propelling chamber of the 30 cm rocket. As a result of the heavier charge, this rocket achieves a range of 4,976 yards.

Both traversing and elevating mechanisms are identical with those of the 28/32 cm piece. Total traverse is 30 degrees, and elevation is 45 degrees. The firing mechanism is electric with a contact box located at the right side of the piece.

A sight bracket is located at the



rear of the framework.

There is a small spade under the frame in the rear, but no other evi-

dence of supports.

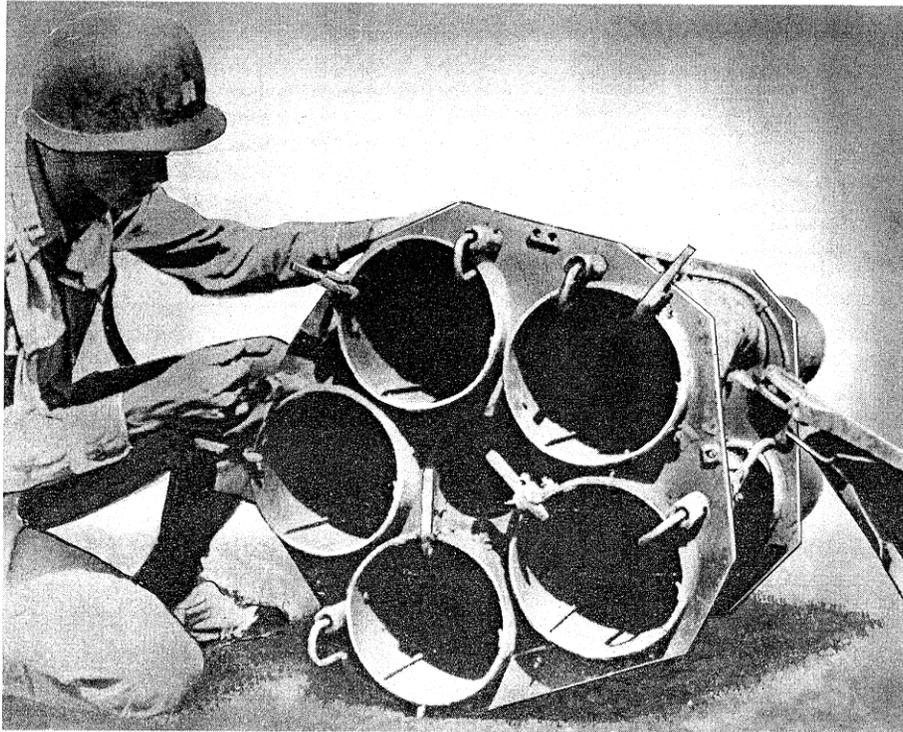
The ammunition for this projector is described on page 354.1.

## ROCKET PROJECTOR

GERMAN



21 cm Nebelwerfer 42



The 21 cm Nebelwerfer consists of a five-barrel assembly and a mounting. The barrels, which are disposed equally about a central channel, are 4 feet, 3½ inches long, have an internal diameter of 9¼ inches, and are fitted at the breech end with ¾ inch angle-iron guides, giving a clear diameter of 8½ inches. Starting with the top barrel, they are numbered 1, 3, 5, 2, 4, probably indicating the order in which they are to be fired. Three spring levers at the base of each barrel prevent the projectile from sliding to the rear. The barrel assembly is strengthened and retained by two steel plates which are fitted around the circumference of the assembly at the breech end and half way between the breech and the muzzle respectively.

A junction box situated at the top of the barrel assembly suggests an electrical firing system similar to that of the 15 cm Nebelwerfer 41. The sight had been removed from the captured weapon, but instructions inside the lid of the sight box indicate that ranges of from 500 to 2,000 meters can be obtained. This, however, is not the extreme range of the weapon.

The mounting is a two-wheeled, pneumatic-tired type with a split trail at the rear and an adjustable leg at the front. The latter is raised when the weapon is being towed, and lowered to give stability when firing.

The Nebelwerfer 42 fires the 21 cm Wgr. 42 Spr. mit Hbgr. Z. 35K.

There appears to be a six-barrel version of the 21 cm Nebelwerfer 42 in addition to the one described above. However, the five-barrel type is believed to afford better balance and greater stability.

## SPECIFICATIONS

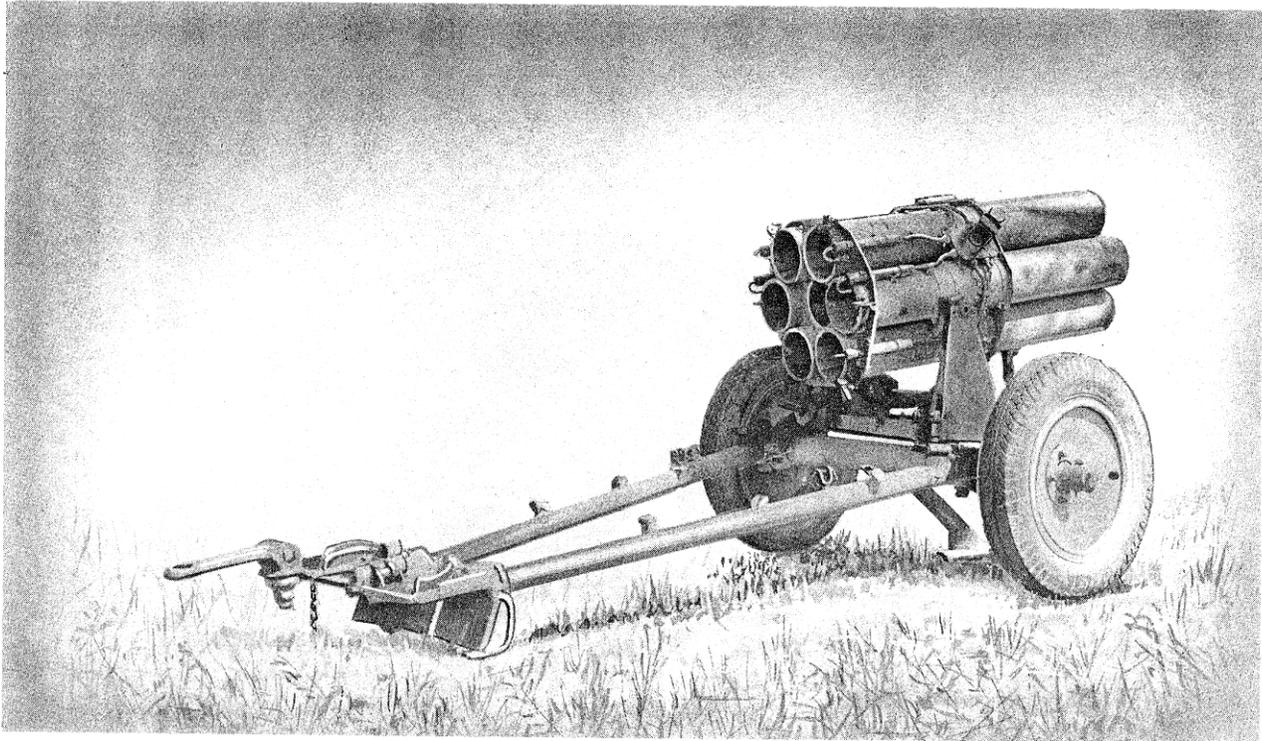
Caliber.....	210 mm (8.27 ins.)
Length of barrels.....	4 ft. 3½ ins.
Range	
45° .....	9,734 yds.
30° .....	8,538 yds.
Ammunition.....	21 cm Wgr. 42 Spr. mit Hbgr. Z. 35K

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**ROCKET PROJECTOR**GERMAN 

15 cm Nebelwerfer 41



This 15 cm Nebelwerfer, formerly known as the Nebelwerfer 41, is a six-barreled, breech-loading weapon firing gas, smoke and high-explosive projectiles. The four-foot barrels are not rifled, but have within them three straight guide rails about 1/3 inch deep. The projectile rotates in flight, however, due to the set of the gas jets. There is no breech mechanism, but each barrel has a kind of spring-operated latch to retain the ammunition in position after loading.

The rocket type projectiles are fired electrically by remote control at the rate of one ripple of six rounds in 90 seconds. They are always discharged from the projector in the following barrel order: 1, 4, 6, 2, 3, 5. This is a fixed firing order calculated to prevent the projector from being overturned by blast.

Due to extremely great dispersion, targets of limited area are not engaged.

The carriage is two-wheeled and has a split trail. Fire is directed by forward observers, telescopic observers, and surveying on targets. Each battery has an observer and a fire control officer.

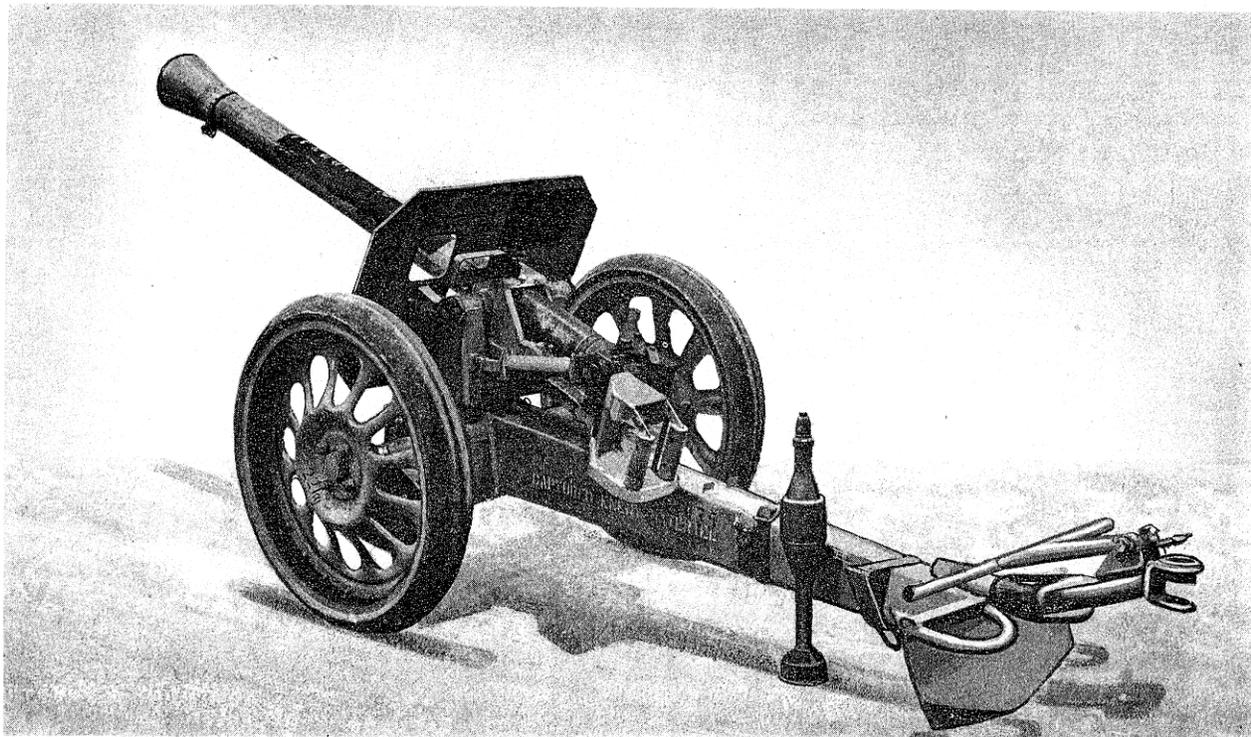
**SPECIFICATIONS**

Caliber .....	150 mm (5.9 ins.)
Length of barrels.....	51 ins.
Rate of fire .....	6 rds. per 90 secs.
Range	
45° .....	7,723 yds.
30° .....	7,018 yds.
6½° .....	2,710 yds.
Ammunition....	H.E. Shell, Smoke Shell, C.W. Shell
Weight .....	1,195 lb.
Traverse .....	30°
Elevation.....	44°
Velocity .....	1,120 f/s

# ROCKET LAUNCHER

GERMAN 

8.8 cm Raketenwerfer 43 ("Püppchen")



This weapon is a closed breech rocket launcher which fires a rocket projectile. It is transported on a two-wheeled carriage, and may be fired from the carriage or from firing segments to lower the silhouette. If necessary, it may be readily disassembled into seven loads for transport. A cone-shaped gas deflector is fitted over but does not protrude beyond the muzzle.

The piece is aimed by grasping two handles fitted to the left rear of the cradle and aligning the open sights on the target. The rear sight is adjustable from 180 to 700 meters.

The launcher fires from a closed breech which is operated by a handle on top of the breech ring. Opening of the breech cocks the hammer which is held in firing position by a sear. When the projectile has been inserted and the breech closed, a squeeze of the right handle depresses the sear, releasing the hammer. A safety device fitted to the left of the firing pin in the center of the breechblock must be turned to "F" position before the launcher can be fired. An additional safety feature prevents the hammer from striking the firing pin unless the breech is fully closed. The small shock of recoil developed by the rocket gases against the closed breech is transmitted directly to the spade.

Ammunition used with the rocket launcher is a modified version of the 8.8 cm rocket projectile, having a percussion primer instead of the electric type. The rocket is fitted with a base plate with a protruding rim to seat the round in the tube. The base plate and primer are the only parts of the round which are extracted after firing.

## SPECIFICATIONS

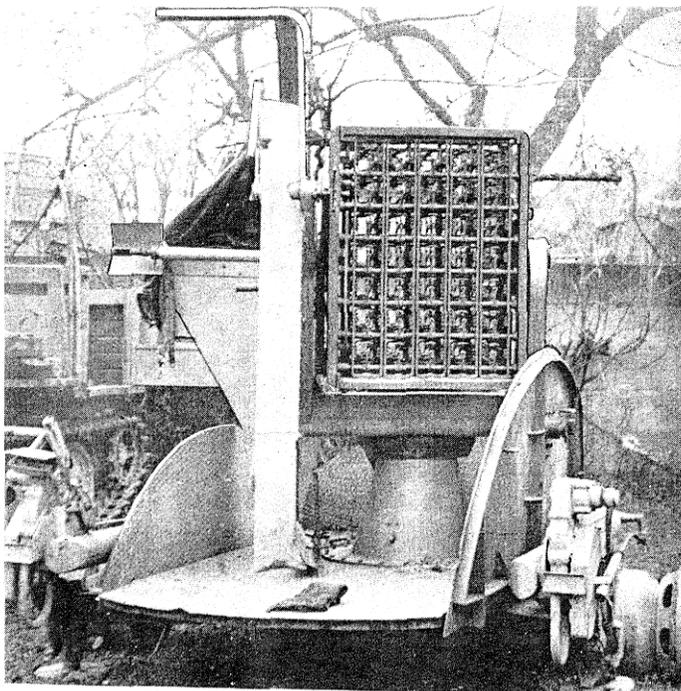
Caliber .....	88 mm (3.46 ins.)
Weight (firing position) .....	315 lbs.
Length of weapon (overall) .....	9 ft., 9 ins.
Length of barrel .....	63 ins.
Height (traveling position).....	2 ft., 11 ins.
Height (on segments) .....	1 ft., 7½ ins.
Width (overall) .....	3 ft., 4 ins.
Length of bore	} ..... Smooth bore
No. of grooves	
Width of grooves	
Depth of grooves	
Width of lands	} ..... Smooth bore
Muzzle velocity .....	
Max. range (horizontal) (limited by sight) .....	765 yds.
Rate of fire .....	.....
Traverse on wheels: Right (max.).....	28°
Left (max.) .....	28°
Traverse on firing segments .....	360°
Elevation .....	23°
Depression .....	14°
Length of recoil .....	none
Ammunition .....	8.8 cm R. Pz. B. Gr. 4312
Wt. of projectile .....	5 lbs., 13 ozs.

\*Not verified.

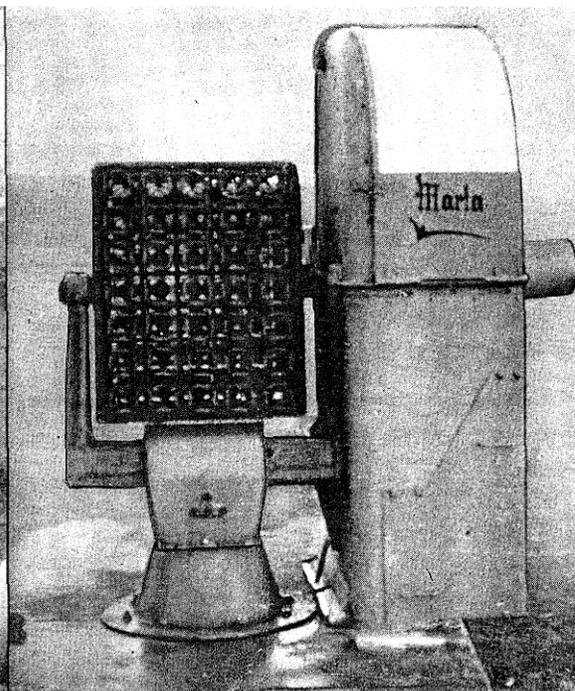
# MULTIPLE ROCKET LAUNCHER

 GERMAN 

7.3 cm "Föhn"



MOBILE TYPE MOUNT



FIXED TYPE MOUNT

This multiple rocket launcher, used for anti-aircraft barrage purposes and known as the "Föhn" is of different design from any other weapon of its type used by the Germans. Launching sites were located along river fronts, indicating the use of this weapon against river crossings. There are 35 individual launchers, each 31 inches long and approximately 7.3 cm square, assembled in 5 horizontal and 7 vertical rows. The rockets are fired by hammer type firing pins mounted on horizontal shafts. All 35 of the pins are actuated by a single trigger. The whole assembly measures 32 inches from top to bottom, and 23 inches from side to side. A simple clamp at the rear of the racks holds the rockets in position until firing takes place. The frame of the assembly is made of 3/16-inch metal.

A trunnion, set in each side of this framework, rests upon arms extending up from the pedestal base. The weapon, with its pedestal base, is used with either a mobile or fixed mount. When used as a mobile mount, the launcher is fitted with a circular metal folding platform mounted on a 2-wheeled trailer. The fixed launchers are not provided with the folding platform, and it is believed that they are normally set up more or less permanently on sheet iron platforms.

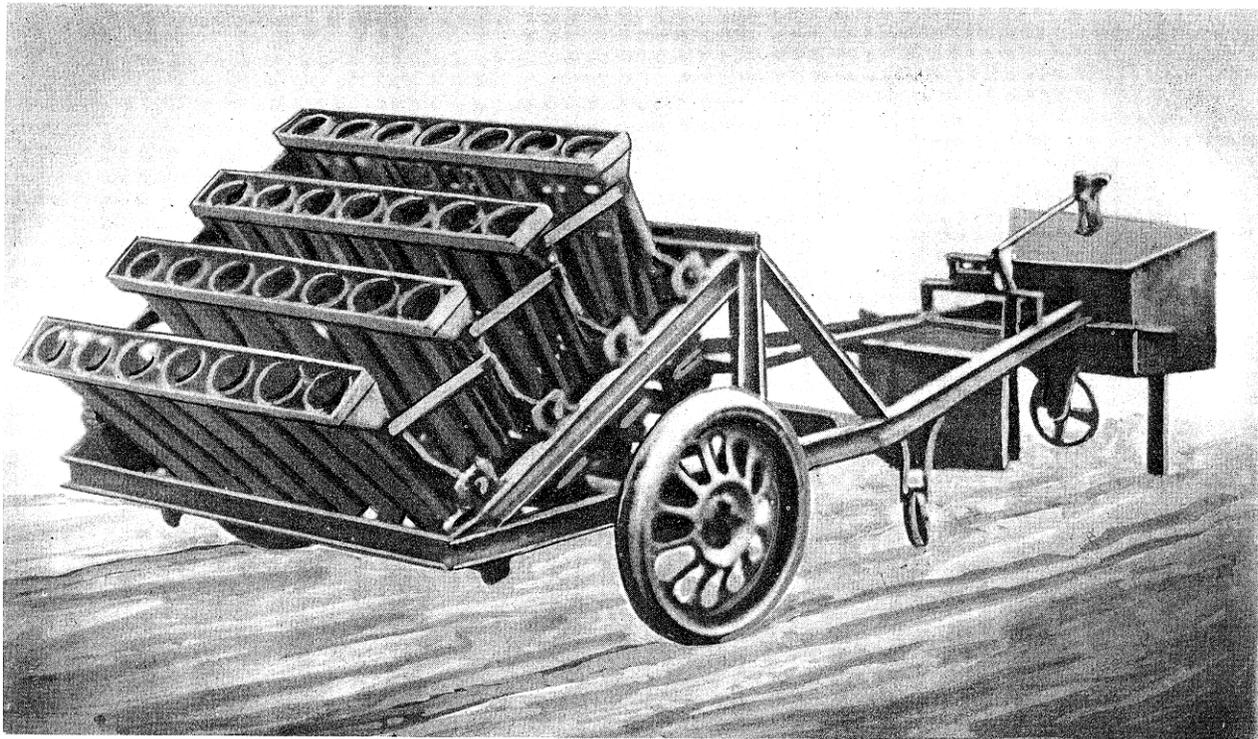
The sight, trigger mechanism, and elevating and traversing mechanisms are mounted on the inside of a metal protective shield located on the left side of the launcher. Elevation is from  $-10^{\circ}$  to  $90^{\circ}$ . The upper part of the front wall of the shield is made of transparent plastic for sighting purposes.

The 7.3 cm Raketen Sprenggranate, used with the launcher, is a spin stabilized rocket fitted with a nose percussion fuze and a self-destroying delay element ignited by the burning propellant.

## SPECIFICATIONS

Traverse .....	360°
Elevation .....	90°
Depression .....	$-10^{\circ}$
Ammunition	
7.3 cm R. Sprgr. (H.E.)	
Weight of complete round .....	6 lbs.
Weight of propellant .....	1.19 lb.
Weight of explosive charge .....	0.62 lb.
Type of explosive .....	"95"
(RDX/TNT/WAX = 55/40/5)	

## 7.5 cm MULTIPLE FORTRESS ROCKET PROJECTOR

GERMAN 

This projector consists of 28 projector rails mounted in four rows of seven each, at the forward end of a long, low carriage. The projectors are constructed of welded T-section steel bar. Each row is a separate assembly, and is bolted to an inclined welded steel superstructure built above the carriage. The projectors are displaced from the center both for line and elevation to give dispersion of fire. Each row is fired as a unit by means of a bar provided with a firing hammer and striker for each projector. Each of the four bars may be separately cocked, and all may be fired by one pull of the firing cable from the central point.

The carriage consists of a framework of U-section steel extended well to the rear, where it terminates in a protected control point containing the elevating handwheel, the firing cable, and two handgrips for traverse. A 1 cm thick (0.39 inches) protection shield is provided. There are two metal-rimmed, rubber sprung detachable wheels 27 inches in diameter. The equipment can be traversed about a fixed center pivot or about its wheels. The center pivot is locked into a bracket welded to the center of the axle-tree and rear support is provided by two steel rollers welded on the under side of the carriage.

Each row of projectors is independently trunnioned and all four are elevated together by means of a linkage through a chain drive from the handwheel.

## SPECIFICATIONS

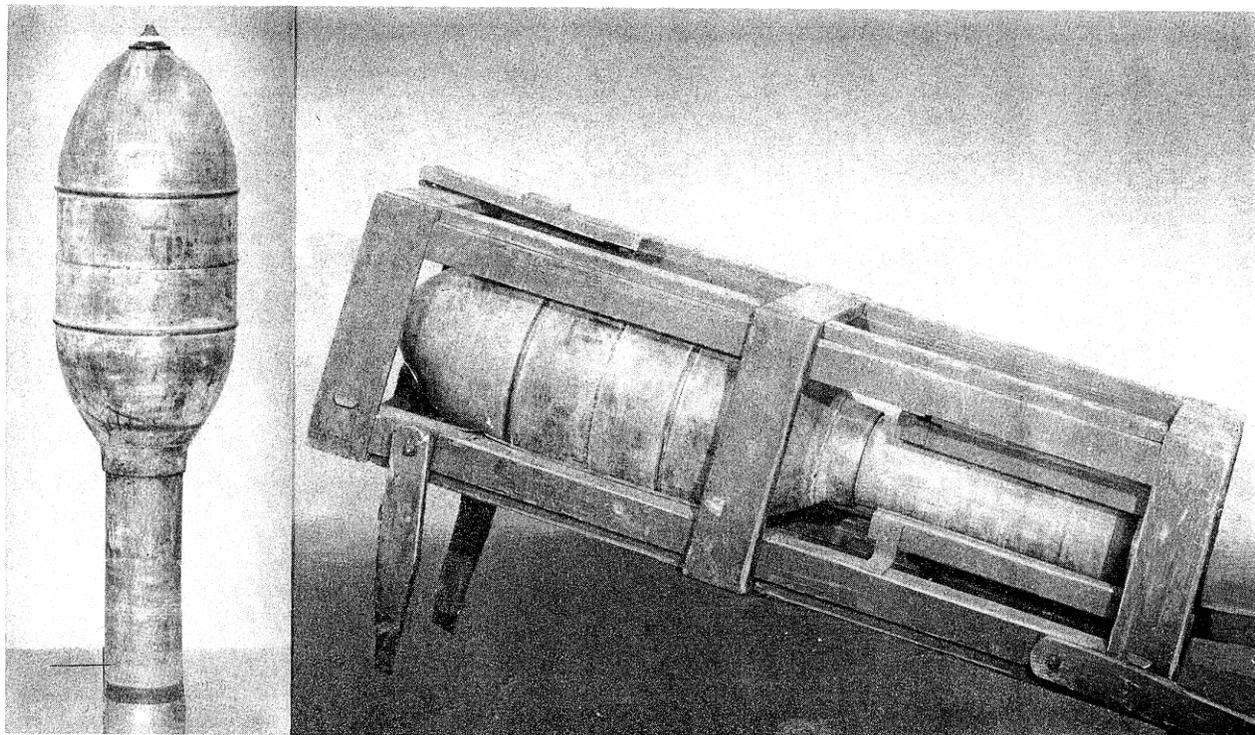
Overall length (approx.) .....	14 ft.
Overall width .....	5 ft., 11 ins.
Track (wheel center to center).....	5 ft., 7 $\frac{1}{2}$ ins.
Width of each projector frame .....	49 ins.
Depth of each projector frame .....	5 $\frac{1}{4}$ ins.
Maximum height (above center pivot platform) .....	3 ft., 4 ins.
Maximum height (on road wheels).....	4 ft., 5 ins.
Elevation (approx.) .....	55°
Depression (approx.) .....	4°

**32 cm ROCKET PROJECTILE (Incendiary)**

GERMAN



32 cm Wurfkörper M. Fl. 50



The operation of this rocket is very similar to that of the 28 cm Wurfkörper. It is fired from the crate, either metal or wood.

This rocket is stabilized by rotation due to the angle of the jets, of which there are 26 inclined at an angle of  $14^{\circ}$ . The internal throat diameter of the jets is 5.5 mm.

The motor tube is a solid forging, machined inside and out and threaded externally at both ends. The closed end screws into the bomb section; the open end receives the venturi block.

The propellant charge consists of a single multiperforated stick. It is supported at the venturi end on a flat grid held to the venturi block by means of a bolt. The grid consists of a ring  $3/16$  inch thick,  $4\frac{3}{8}$  inches in external diameter, and  $3\frac{1}{8}$  inch in internal diameter supported by six small cylindrical spacers  $\frac{1}{2}$  inch in diameter and  $\frac{3}{8}$  inch high from a flat plate  $1/10$  inch thick and  $4\frac{3}{8}$  inches in diameter. The free space at the closed end of the  $4\frac{3}{8}$  inches in diameter.

The ignition system consists of an electrical igniter inserted in place of the screw in the bolt in the center of the venturi block. Behind the igniter lies a bag of rough cloth containing 10 grams of the primary igniter composition in the form of six-pointed star-shaped flakes. A maintainer composed of compressed pellets in an aluminum container is situated at the closed end of the tube and acts as an igniter composition. The rapid transmission of the flash between these two is effected by the lengths of inflammable tubing housed in the conduits of the charge. The one in the center conduit is quickmatch; the tube is closed at each end by a gunpowder pellet.

A thin sheet of aluminum acts as a sealer at the venturi end. This does not appear to be sufficient to prevent the entrance of moisture. The bomb head contains 11 gallons of oil and a point-detonating fuze.

**SPECIFICATIONS**

Weight (total) .....	174 lb. (approx.)
Weight of motor tube.....	23 lb., 14 oz.
Weight of motor tube (filled).....	49 lb., 8 oz.
Weight of venturi block and bolt....	9 lb., 6 oz.
Weight of propellant charge.....	14 lb., 7 oz.
Weight of grid.....	1 lb., 1 oz.
Length (total) .....	5.08 ft.
Length (body) .....	3.3 ft.
Length of motor tube (overall).....	18 $\frac{5}{8}$ ins.
Diameter of bomb.....	32 cm
Diameter of motor tube (external).....	5 $\frac{1}{2}$ ins.
Diameter of motor tube (internal).....	5 ins.
Depth of motor tube (internal).....	18 ins.
Range (maximum) at $42^{\circ}$ .....	2,217 yds. (approx.)

RESTRICTED

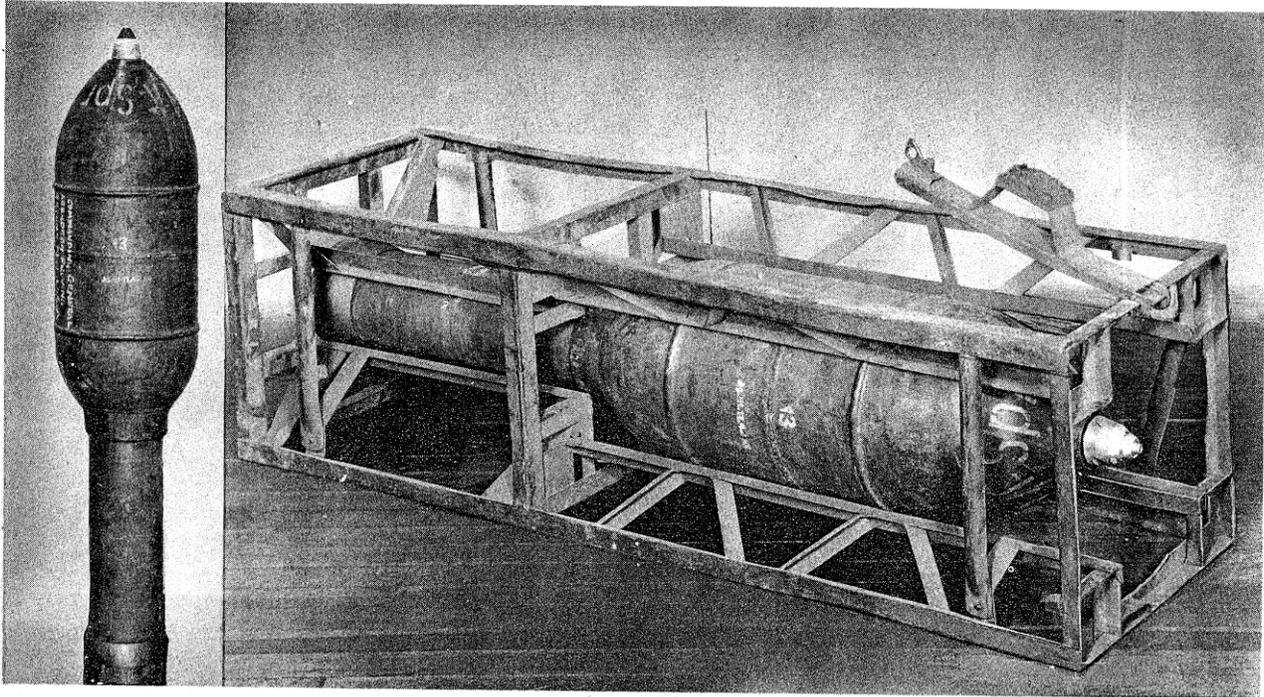
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**28 cm ROCKET PROJECTILE**

GERMAN



28 cm Wurfkörper Spr.



This package-type rocket is a self-contained unit fired from a metal or wood crate. Firing is accomplished by "pointing" the crate at the target, resting the front part of the crate on a mound of dirt (or a similar rest) at an angle from 5° to 45°, and firing by means of a hand electrical firing system.

The propellant charge, contained in the motor tube, is in the form of one stick weighing 14 lb., 9 oz. with one central hole and eight annular holes.

Eight grooves are formed in the sides of the propellant stick, and celluloid tubes are fitted into these grooves. A length of quickmatch in the central hole is inclosed in a celluloid tube.

There are two igniters, one at the front and one at the rear of the propellant. The rear igniter consists of a cloth bag containing 10 grams (154 grains) of NC powder. The front igniter is a metal holder containing a flash composition with a layer of initiating composition.

The bursting charge is contained in the large section, directly forward of the rocket motor tube.

The booster, known as Zdlq. 36, consists of a cylindrical aluminum container filled with penthrite wax and perforated at the top to house a thimble-shaped detonator.

The fuze, Wgr. Z. 50, is a point-detonating or graze action type. The safety pin is removed before firing, leaving the two centrifugal bolts and a split ring to act as a safety feature in flight. The detonator is situated in the inertia pellet.

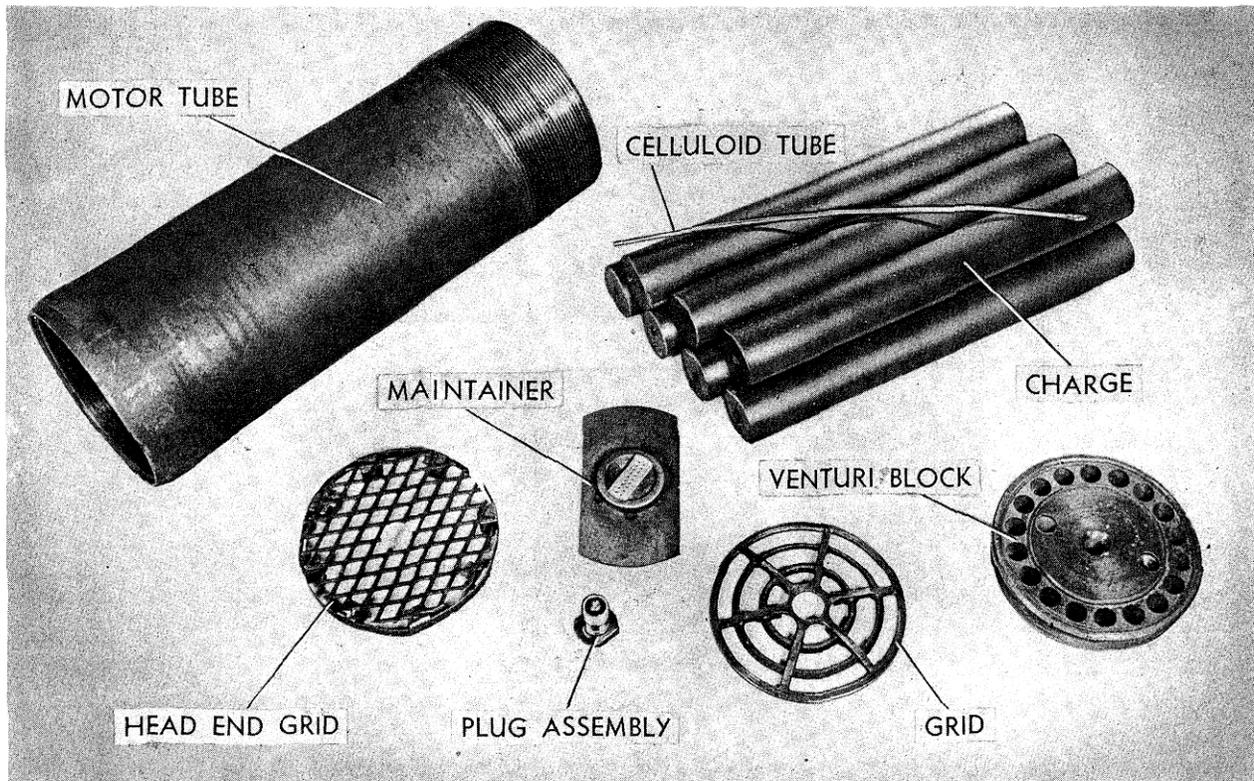
There are 26 jets at the end of the motor tube inclined approximately 12° right, giving it rotation in flight for stability. The internal diameter of the jets is 0.5 cm (.19 in.) and the external diameter 1 cm (.38 in.).

**SPECIFICATIONS**

Weight (total) .....	181 lb.
Length (overall) .....	3 ft., 11 ins.
Length (body) .....	2 ft., 4½ ins.
Length (tail) .....	1.85 ft.
Diameter (body) .....	11 ins.
Diameter (tail) .....	.59 in.
Number of ports.....	26
Contents .....	110 lb. TNT
Range (maximum) at 42°....	2,337 yds. (estimated)

**30 cm ROCKET**GERMAN 

30 cm Wurfkörper 42 Spreng



This rocket is packed in a wooden crate from which it may be fired in the same manner as the 28 cm rocket described on page 354. It is also fired from a rocket projector consisting of six welded metal frames mounted on a two-wheeled, split trailed carriage described on page 350.

This model has been selected to illustrate the construction of the motor assembly of a typical rotating rocket. The motor tube is 0.43 inch thick, closed at one end, and threaded inside to take the venturi block. Eighteen venturis are drilled in this solid block. The throat diameter of each venturi is 0.365 inch with an exit section of approximately 0.82 inch in diameter. The axes of the venturis are inclined at an angle of  $12^{\circ} 42'$  so that the effluent gases cause the round to rotate. A threaded hole in the center takes the primer unit.

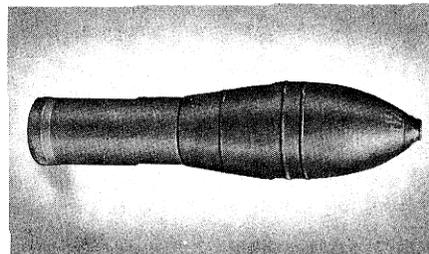
Seven tubular sticks make up the propellant charge composed of nitrocellulose and diglycol dinitrate.

The sticks are supported at the venturi end on a grid. The center stick contains a length of quickmatch in a celluloid tube, and ending in a primed maintainer pellet. A small primer unit screwed into the steel venturi plug flashes directly on to the gun powder pellet at the end of the celluloid tube.

This motor unit is similar to that of the 15 cm Wurfgranate. However, because of the heavier charge in the 30 cm ammunition, the metal mesh has been introduced to prevent the maintainer pellet from being crushed by the central stick of the propellant charge if the rocket is dropped.

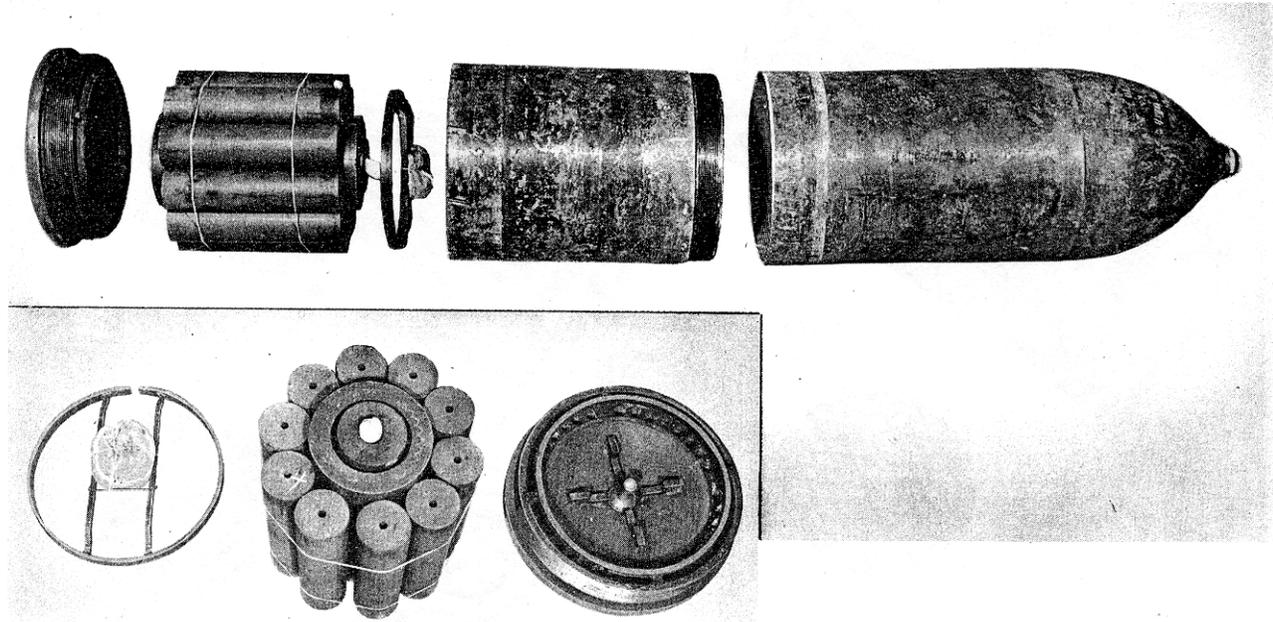
**SPECIFICATIONS**

Weight of filled motor unit.....	129 lbs., 10 ozs.
Weight of filled bomb.....	146 lbs., 4 ozs.
Weight of propellant charge....	33 lbs., 3 $\frac{3}{4}$ ozs.
Length (overall) .....	47 ins.
Length of bomb .....	28.5 ins.
Length of motor tube .....	22.5 ins.
Diameter of bomb .....	11.8 ins.
External diameter of motor tube .....	8.56 ins.
Length of propellant charge .....	18.4 ins.
Burnt velocity .....	754 f/s
Range, maximum .....	4,976 yds.



**ROCKET PROJECTILE FOR RAKETENWERFER 61**GERMAN 

38 cm R. Sprgr. 4581



This projectile is fired from the Raketenwerfer 61 (see pages 38.3 and 38.4). It shows a radical departure from standard spin-stabilized rocket design by the use of insert splines at the after end of the motor body. These splines, fitting into the rifling of the projector liner, aid in giving an initial spin to the projectile.

The rocket consists of three main assemblies: the high explosive body, motor body, and nozzle assembly.

The high explosive body of two-piece welded construction is threaded internally at its after end to receive the motor body. The booster pocket and fuze adapter assembly is welded in position at the nose of the high explosive body. The bourrelet is located just behind the welded junction of the ogive and the cylindrical section.

The motor body is threaded externally to screw into the high explosive body and internally to receive the nozzle assembly. Both the explosive body and nozzle assembly are secured by means of two diametrically opposed set screws. Nine grooves for the splines are machined into the base of the periphery of the motor body. The high explosive body is filled with 270 pounds of the German explosive charge 13A, which is 50/50 poured amatol.

The 32 venturi holes in the nozzle plate are set at an angle of 14° to the axis of the rocket. In the center of the nozzle plate there is a threaded hole to receive the igniter primer for the rocket propellant.

A rear spacer ring welded to the nozzle plate aids in the positioning of the outer row of propellant charges.

**SPECIFICATIONS**

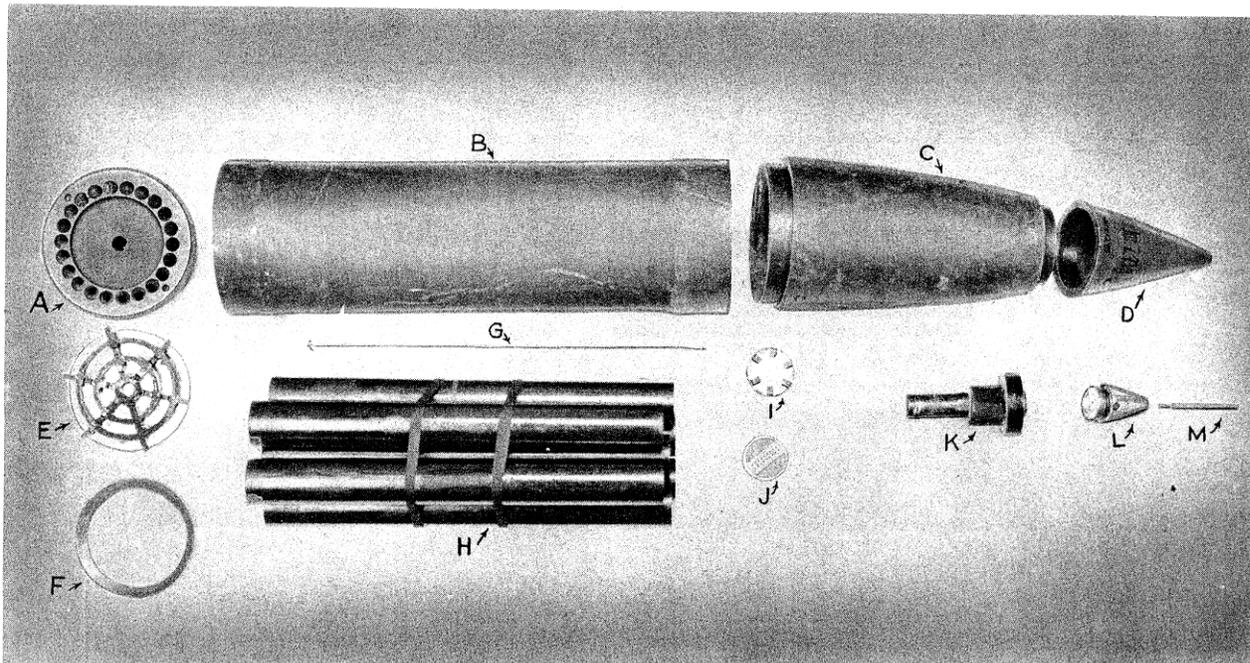
Caliber .....	38 cm (15 ins. approx.)
Total weight of rocket .....	761 lbs.
Overall length (not including fuze).....	56.68 ins.
Diameter of bourrelet .....	14.94 ins.
Maximum range .....	6,179 yds.
Weight of explosive charge .....	270 lbs.
Weight of propellant charge .....	88.5 lbs.
Fuze .....	Point detonating
Weapon from which fired .....	Raketenwerfer 61

**21 cm ROCKET PROJECTILE**

GERMAN



21 cm Wgr. 42 Spr. Mit Hbgr. Z 35 K



This rocket is very streamlined and in outward appearance resembles an artillery projectile. All metal components of the body are machined inside and out and appear to be of mild steel.

A complete round of this ammunition is made up of the following components (see photograph above):

(a) Nozzle assembly containing 22 orifices evenly spaced around the rim of the nozzle. These orifices are set at an angle of 16° from the axis of the rocket. This angle gives the rocket clockwise rotation in flight besides providing forward thrust. In the center of the nozzle there is an ignition hole which receives the electric squib.

(b) Motor body having two bourrelet surfaces.

(c) High-explosive body containing 22.4 pounds of TNT. It is made of mild steel with fairly thick walls and is threaded on its base and screwed into the motor body.

(d) False ogive, which completes the streamlined contour of the rocket.

(e) Trap, a casting painted rust red. Between the trap and the nozzle there is a tinfoil disk which is used as a moisture and dirt seal.

(f) Black powder base igniter.

(g) Igniter wick, a celluloid tube containing a charge of quickmatch.

(h) Propellant charge consisting of seven sticks 21.67 inches long and 2.46 inches in external diameter.

(i) Spacer to hold the head igniter in place and allow for the proper ignition of the entire propellant.

(j) Igniter.

(k) Booster cup.

(l) Point-detonating fuze.

(m) Wooden actuating rod.

**SPECIFICATIONS**

Weight of projectile as fired .....	241.30 lb.
Weight of TNT bursting charge .....	22.40 lb.
Weight of propellant powder .....	39.50 lb.
Weight of high-explosive body .....	65.25 lb.
Weight of propellant body .....	87.75 lb.
Weight of nozzle assembly .....	5.12 lb.
Length .....	49.21 ins.
Diameter .....	8.27 ins.

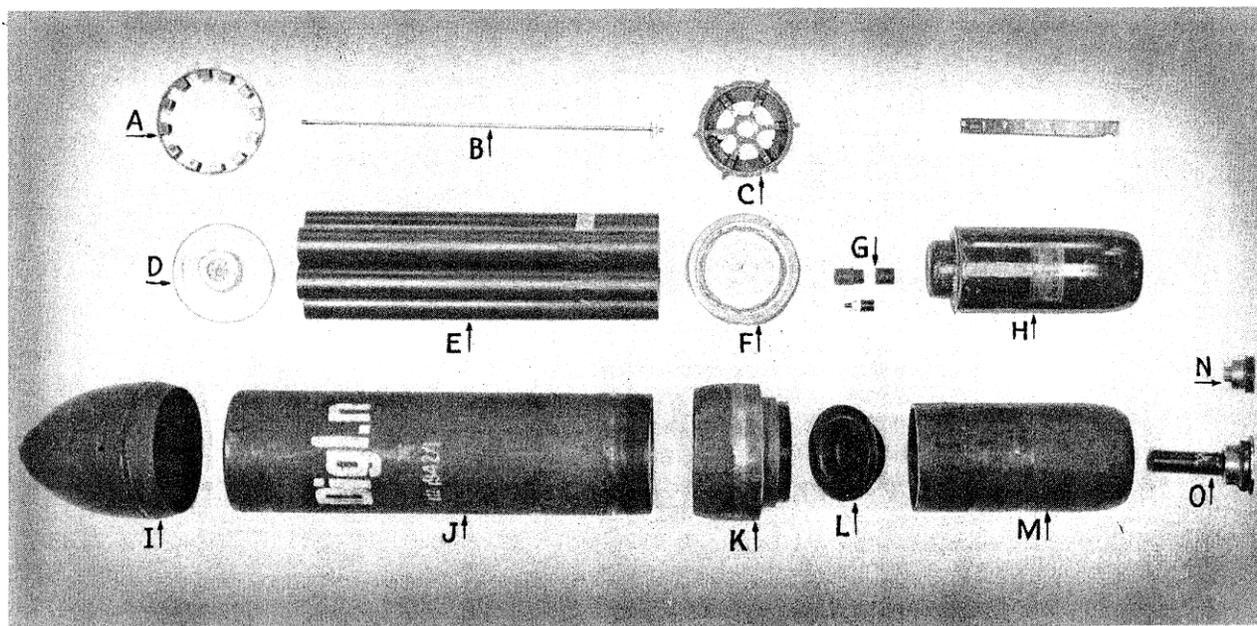
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## 15 cm ROCKET PROJECTILE

GERMAN 

15 cm Wurfgranat 41



This rocket is fired from the German 6-tube Nebelwerfer 41. It resembles an elongated shell with a bulbous ballistic cap. The propellant is contained in the forward part of the projectile and the filling in the rear behind the ring which houses the jets. The propellant powder burns from both ends, giving faster and more even burning. The nozzles are arranged around a projecting annular jet unit about two-thirds of the distance from the nose. The jets are set at an angle to give the projectile rotation in flight, thereby eliminating the use of fins.

A complete round of this rocket projectile is composed of the following components (refer to photograph above): (i) pressed metal ballistic cap, which is screwed onto the projectile; (j) a motor tube; (d) an aluminum disk containing a black powder igniter charge; (a) a pressed metal spacer upon which the sticks of powder rest; (e) seven sticks of uniperforated stick powder; (b) a cellulose igniter tube containing black powder; (c) a cast-iron trap, which is placed over the powder at the rear end of the motor tube; (f) a black powder igniter charge, which is placed over the cast-iron trap; (h) a nozzle assembly, which is screwed to the motor tube; (g) an electric primer, which is inserted in any of the 26 nozzle holes; (l) a pressed iron spacer which fits into the base of the nozzle assembly and provides an air void between the nozzle assembly and the TNT bursting charge; (h) a bursting charge of TNT or a chemical filler contained in a fiber container; (m) a machined steel bursting-charge container; (o) a booster adapter, which screws into the bursting-charge case; (n) a base percussion fuze, which screws into the booster adapter. This fuze is similar to most German base percussion fuzes and arms by centrifugal force.

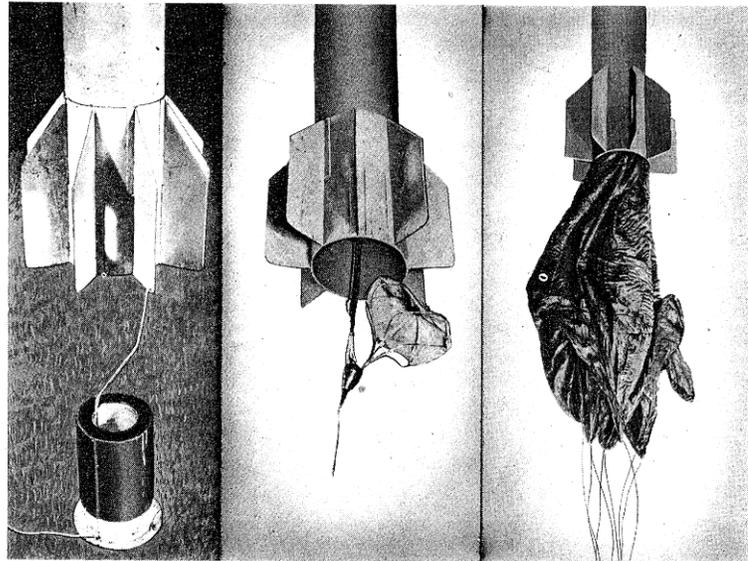
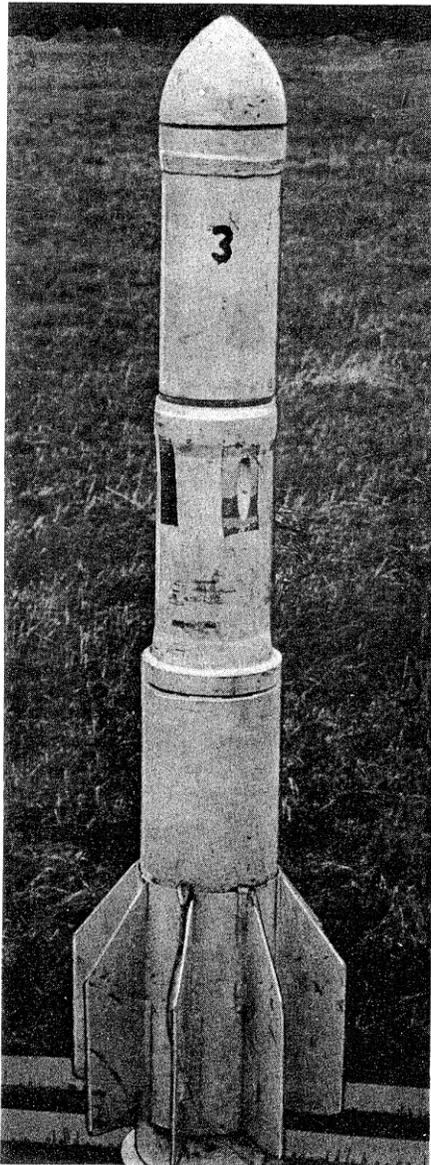
## TYPES

There are three known types of these projectiles in existence, namely:

- A. High Explosive (15 cm Wgr. 41 Spr.)—weight 70 lb.; length 36.6 ins.; maximum diameter 6.2 ins.
- B. C. W. (15 cm Wgr. 41 Grünring)—content chemical
- C. Smoke (15 cm Wgr. 41 Nb)—weight 79 lb.; weight of propellant 14 lb.

## 15.2 cm PARACHUTE AND CABLE TYPE A. A. ROCKET

GERMAN



This is an antiaircraft rocket projectile containing a parachute to which is attached a length of cable, designed for use in large numbers to form a barrage against low flying aircraft. The projectile consists of four parts: nose piece, propellant chamber, parachute housing, and cable housing and tail unit.

The nose piece is ogival in shape and screws onto the forward end of the propellant chamber. It contains a TNT destructive charge, weighing approximately 2.3 pounds, and initiated by means of a delay fuze connected to the propellant chamber.

This is a steel cylinder closed at the forward end and threaded externally at the rear end to fit into the parachute housing. Four drillings in the forward end of the parachute housing form the venturi through which the propelling gases escape.

At the forward end of the parachute housing is a TNT charge, weighing approximately 2 pounds. Below this charge are located the main and pilot parachutes which are attached to the forward end of the cable. The cable housing is constructed in two parts, the lower of which remains on the ground when the rocket is launched. The upper portion has a finned tail unit which fits over the lower portion of the cable housing. The 1/8-inch cable, attached at its forward end to the parachute, is coiled the length of the cable housing and passes through a hole in the lower portion to a ground anchor.

After launching, the projectile continues upwards until the whole of the cable has been uncoiled; the parachute is then pulled out of the parachute housing and remains suspended in the air until dragged to earth by the weight of the cable. The rocket casing continues in flight until a delay igniter initiates the destructive charge in the nose of the projectile.

## SPECIFICATIONS

Total weight (approx.) .....	150 lbs.
Weight of parachute housing (containing parachutes and H.E. charge)....	28 lbs., 1 oz.
Weight of fins and cable housing	90 lbs., 4 ozs.
Weight of nose (containing H.E. charge) .....	4 lbs., 12 ozs.
Weight of rocket motor unit .....	27 lbs., 11 ozs.
Weight of propellant charge .....	11 lbs., 10 ozs.
Length of projectile (overall) .....	58.2 ins.
External diameter (maximum) .....	7.09 ins.
External diameter of motor tube .....	5.51 ins.
Internal diameter of motor tube .....	5.2 ins.
Length of propellant charge .....	11.7 ins.
Length of cable (approx.) .....	950 yds.
Diameter of main parachute .....	11 ft.
Diameter of pilot parachute .....	6 ins.

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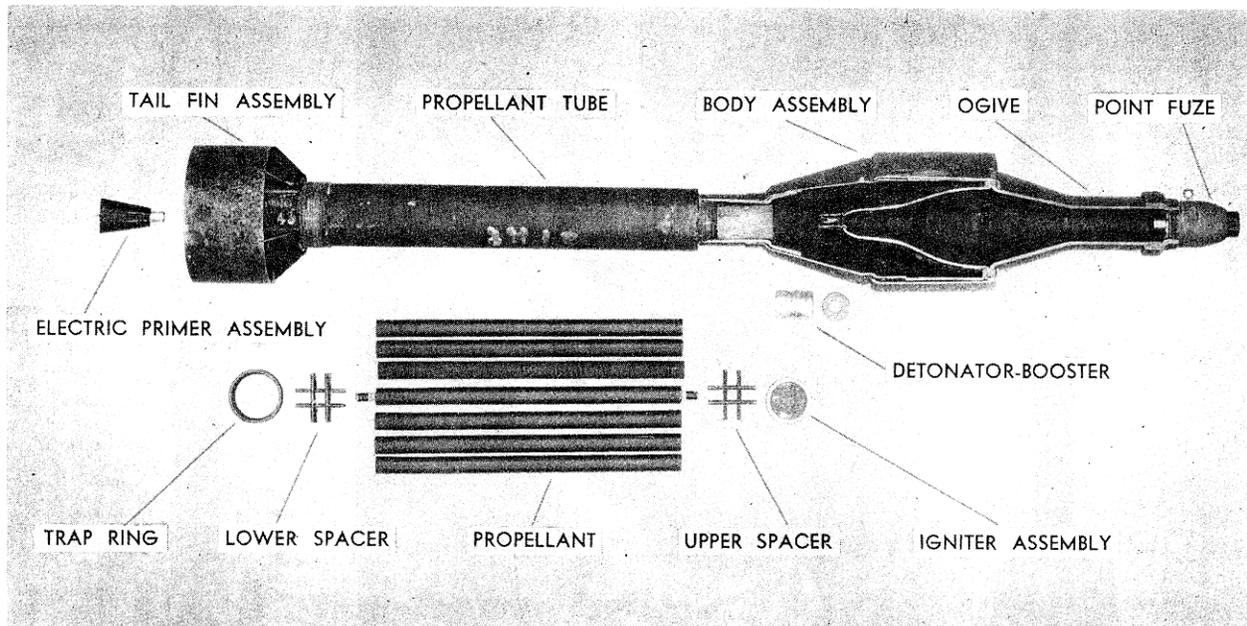
OFFICE CHIEF  OF ORDNANCE

1 May, 1945

# HIGH EXPLOSIVE-ANTITANK ROCKET GRENADE

GERMAN 

8.8 cm R. Pz. B. Gr. 4322



This fin stabilized rocket projectile is fired from the German counterpart of the U. S. "Bazooka" (see page 217) and has a maximum effective range of 165 yards. Eight and one-half-inch armor penetration has been obtained in static tests with a standoff of approximately 6½ inches.

The complete round consists of a point fuze high explosive, hollow charge loaded projectile assembled to a steel tube with a venturi and stabilizer assembly attached, containing an igniter, propellant and electric primer. The AZ 5095 fuze is of the point detonating type which in tests gave an approximate fuze functioning time of 0.0002 seconds (impact to detonation). The projectile assembly consists of the following stamped sheet steel parts: a body which contains the bursting charge, an adapter, a collar, a band, and a slightly heavier sheet steel nose. A detonator-booster of the German Kl. Zdlg. 34 NP type is embedded in the bursting charge to the rear of the flash tube. The bursting charge is cyclotol (41.2% TNT, 58.8% cyclonite) weighing 1 lb., 7.2 ozs. The propellant and tube assembly consists of the propellant tube and the seven propellant grains and igniter assembly, located in the forward end which it holds. The seven propellant powder grains are approximately 7.6 inches in length x .45 inch outside diameter, and have a central perforation .22 inch in diameter throughout their length. The composition is 64½% nitrocellulose and 34½% DEGN, with a small percentage of stabilizer.

A new type of ammunition, the R. Pz. B. Gr. 4999 is reported to give good performance up to a range of 220 yards, 25° C. (77° F.).

## SPECIFICATIONS

Weight (complete, rocket as fired).....	7.26 lbs.
Weight of high explosive filler .....	1.47 lbs.
Weight of fuze assembly .....	.175 lb.
Weight of igniter assembly .....	.021 lb.
Weight of propellant charge .....	.382 lb.
Length (overall) .....	25.56 ins.
Diameter (external) .....	3.437 ins.
Burnt velocity at 50° F. (approx.) .....	340 f/s*
Burning distance (approx.) .....	7 ft.*
Fuze functioning time (approx.).....	.0002 seconds
Maximum pressure .....	6,910 lbs. per sq. in.*
Maximum thrust .....	1,716 lbs.*
Impulse .....	87 lbs. second**
Maximum effective range .....	165 yds.

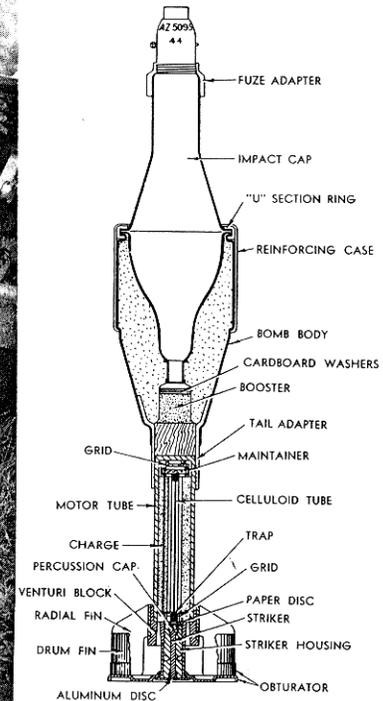
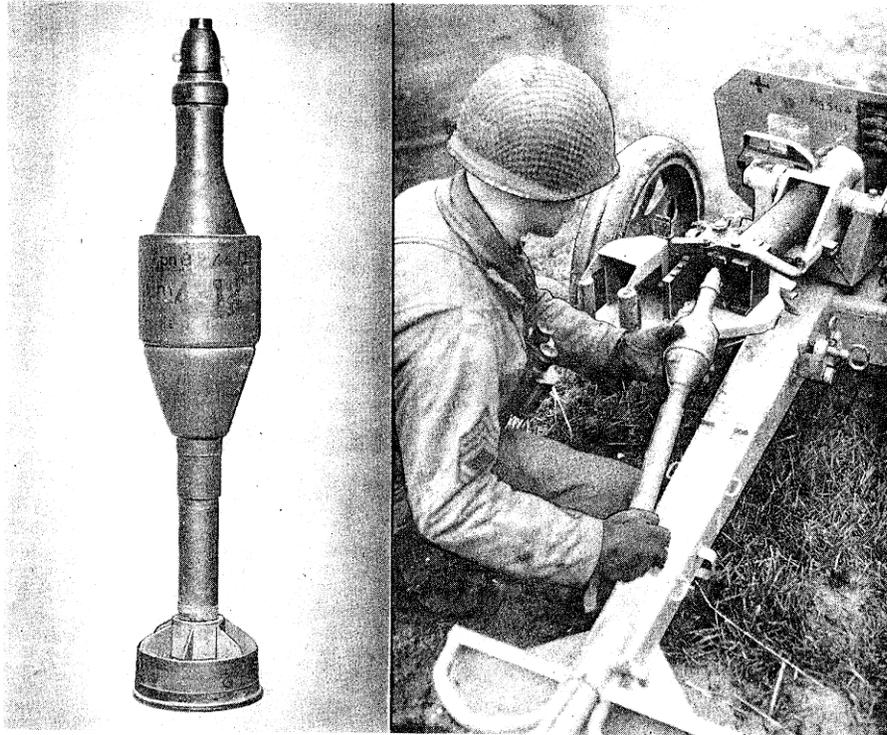
\* These figures are from firing a single round.

\*\* These values doubtful; only one rocket round was statically tested with propellant temperature 41° F.

## ANTITANK ROCKET GRENADE

8.8 cm R. Pz. B. Gr. 4312

GERMAN 



This projectile is fired from the German 8.8 cm Raketenwerfer 43 (Püppchen—see page 352.1). From this weapon, as limited by the sight, a maximum effective range of 700 meters (765 yards) is obtained. The explosive head is identical to that of the rocket fired from the German counterpart of the "Bazooka" (page 357).

The fuze (AZ 5095) functions as follows: the force of set back causes the set-back ring to move rearward, bending the two prongs of the stirrup spring. These prongs, by engaging in the inside groove of the set-back ring prevent the ring from returning forward. Meanwhile, the striker needle is held away from the primer detonator by a flat, coiled clock spring inside the set-back ring. The clock spring unwinds, expanding against the inside of the fuze body, thus providing a slight delay in the arming of the fuze.

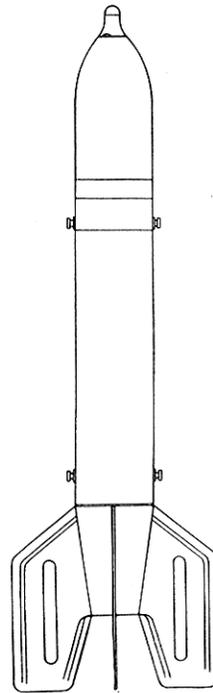
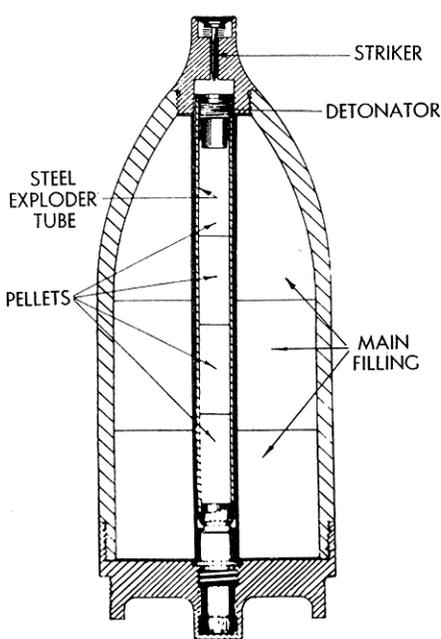
The propellant is a double base powder in the form of a single grain with 14 perforations. There is a hole .364 inch in diameter through the center of the grain. Three lands on the outside of the grain insure an outside burning surface. A triangular-shaped spacer holds the head igniter firmly against the quickmatch. The quickmatch fits in a slight indentation in the head igniter. The primer used in the "Püppchen" rocket is the standard No. 26 percussion primer found in many German artillery fuzes.

## SPECIFICATIONS

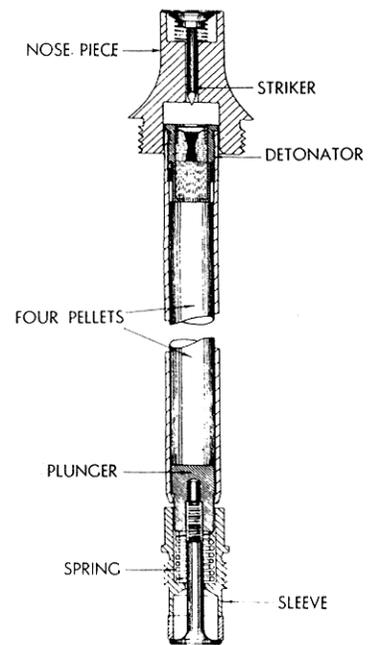
Weight (complete, as fired).....	5 lbs., 13.06 ozs.
Weight of H.E. filler .....	1 lb., 7¼ ozs.
Weight of fuze with detonator .....	3.15 ozs.
Weight of motor and tail assembly..	1 lb., 8.5 ozs.
Weight of propellant .....	1.63 ozs.
Overall length .....	19.64 ins.
Length of propellant grain .....	4.95 ins.
Diameter of propellant grain .....	.85 ins.
External diameter .....	3.494 ins.

## H. E. UNROTATED ROCKET

### 8 cm Raketen Sprenggranate



GERMAN 



## H. E. WARHEAD

This rocket is actually 78 mm in diameter. Two features distinguish it from other German rockets: the use of tail fins to secure stability in flight without rotation, and the employment of a novel fuze arming device.

The complete round weighs 15.19 pounds and is nearly 28 inches long. Its two principal components are the nose fuze high explosive war head and the rocket motor tube. The shell is attached by means of an adaptor ring and the motor tube is closed by a cone-shaped assembly carrying the fins and containing the venturi and propellant supporting grid. Six tubular sticks of cordite form the propellant ignited by a circular gun powder igniter set off by a wire ignition bridge. The launcher used is the Mantelrohr.

The nose fuze consists of a steel nose piece housing a light alloy striker held by a light spring, a percussion detonator, a magazine containing four pressed pellets, and a thermal arming device. When the rocket is fired, the heat of the propellant gases melts a ring of fusible metal, permitting the detonator and magazine to approach the striker. The main filling of the high explosive head is pressed flake TNT.

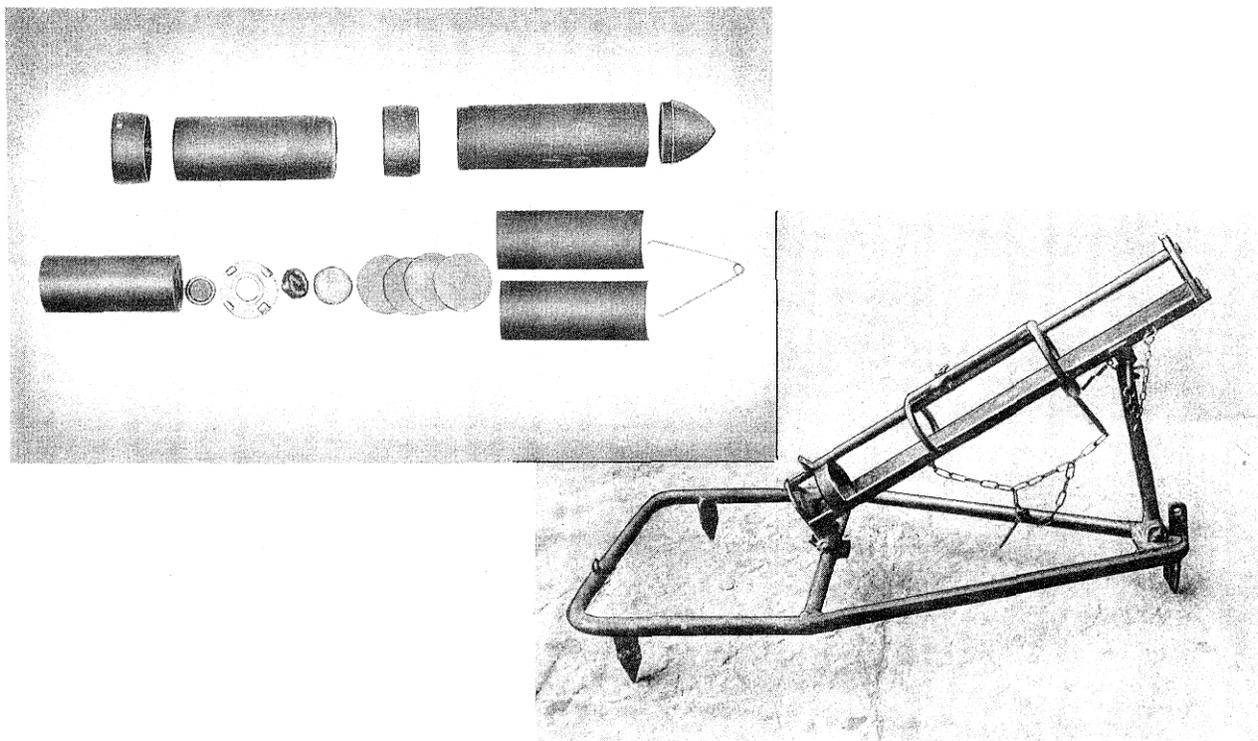
## FUZE MECHANISM

### SPECIFICATIONS

Weight of complete round .....	15 lbs., 3 oz.
Weight of motor unit with central adaptor..	10 lbs.
Weight of high explosive head with central adaptor .....	6 lbs., 5 oz.
Weight of high explosive filling.....	1 lb., 5½ oz.
Weight of fuze (approx.) .....	4 oz.
Weight of propellant sticks .....	2 lbs., 3 oz.
Length of rocket .....	27.7 ins.
Ground range (estimated) .....	6,300 yds.

## 7.3 cm PROPAGANDA ROCKET PROJECTILE AND LAUNCHER

GERMAN 



This is a rocket projectile of conventional design, but having instead of the usual high explosive filling a number of propaganda leaflets in the forward compartment. The projectile consists basically of two steel tubes screwed into a central sleeve. The upper tube carries the propaganda leaflets and is closed at the forward end by a bakelite ballistic cap; a small bursting charge in the sleeve serves to expel the leaflets. The lower tube contains the propellant and is closed at the lower end by a screwed-in base plug.

The leaflets are wrapped around a steel spring and are in turn inclosed in a light metal cylinder split horizontally. The ejection charge for the leaflets is fired by an igniter and a delay train when the split cylinder containing the leaflets is ejected; the spring around which the leaflets are wrapped forces apart the two halves of the cylinder and scatters the leaflets.

The projector used for launching the rocket is of simple design and construction. The base frame is formed of 1¼-inch tubular steel with three spades welded on the underside. A crosspiece of the same tubular steel acts as a brace and also forms a base for the elevation pivot of the rocket guide. This guide consists of a length of 1¾-inch angle iron 29½ inches long.

The launcher is operated on the mortar principle, that is, the rocket is placed on the trough and is held about twenty inches above the striker (which corresponds to the firing pin of a mortar) by a release lever. A cord which the operator may pull from a safe distance leads from the release lever, thereby permitting the rocket to slide down against the striker.

## SPECIFICATIONS

### ROCKET

Overall length of complete round.....	16 3/32 ins.
Length of plastic cap .....	2.21 ins.
Length of message body .....	6.87 ins.
Length of propellant chamber .....	4.70 ins.
Length of nozzle assembly .....	1.30 ins.
Length of stick powder .....	5.234 ins.
Diameter of stick powder .....	2.308 ins.
Weight of complete round .....	6 lbs., 10 oz.
Weight of propellant .....	1 lb.

### LAUNCHER

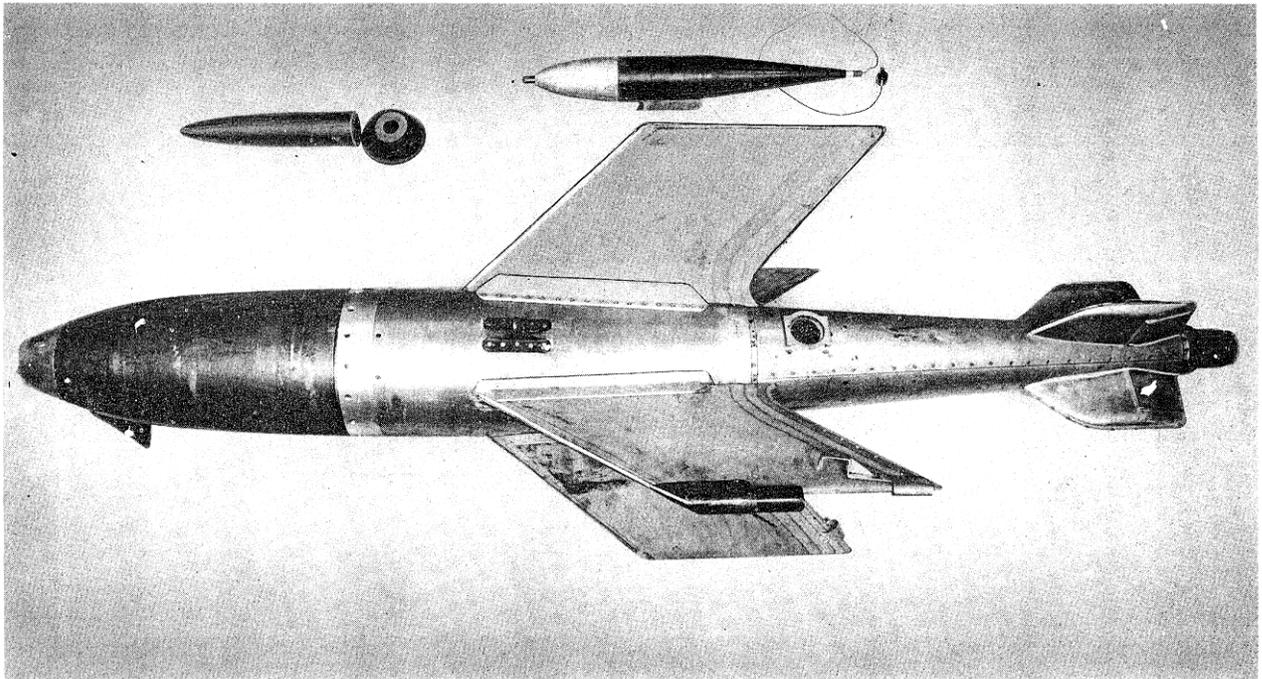
Overall length .....	45.7 ins.
Overall width .....	19.7 ins.
Length of guide .....	29.5 ins.
Overall height with guide at 45° .....	28 ins.
Weight .....	27 lbs.

# AIRCRAFT LAUNCHED ANTI-AIRCRAFT ROCKET

GERMAN



X 4



The X 4 is an anti-aircraft rocket designed by the Germans to be launched from planes. It was manufactured and reported to have been successfully tested, but never reached the point of combat operation. It is a wire-controlled, rocket-propelled, fin-stabilized missile fitted with a proximity fuze warhead. The propulsion system is a bi-fuel rocket. Stabilization is achieved by means of four large fins fitted to the body of the rocket, and four smaller fins fitted to the tail. The smaller fins bear solenoid-operated control surfaces through which two-dimensional directional control is achieved. These are operated from the parent aircraft by means of a control unit and two insulated wires leading to the rocket. These wires are about  $3\frac{3}{4}$  miles long.

Precise information about the warhead and fuze system has not so far been recovered. The warhead consists of an uncased moulded grain of dinitroglycol-based explosive which depends on high blast effect. The fuze is a combination of acoustic proximity, impact, and self-destructing type. The proximity feature is functioned by aircraft propeller noises and a delay of  $1/50$ -second is provided to enable the missile to approach the target after the acoustic impulse initiates the fuze. The body of the rocket houses the helical aluminum tube fuel tanks and combined two-compartment steel air bottle. The venturi protrudes from the tail portion. The rocket is made to rotate about its axis at the rate of one rotation per second. This permits stabilization in line of flight by a single gyro. The missile is carried on the parent aircraft on a conventional bomb carrier modified for this special purpose.

## SPECIFICATIONS \*

Length (overall) .....	200 cm (6 ft., $6\frac{3}{4}$ ins.)
Length of warhead .....	45 cm (1 ft., $5\frac{3}{4}$ ins.)
Diameter of warhead (at base) .....	22 cm (8.675 ins.)
Total weight before launching .....	60 kg. (132.3 lbs.)
Weight of warhead .....	20 kg. (44.1 lbs.)
Fuel.....	4.5 liters (approx.) 98-100% nitric acid
	2 liters (approx.) 57% crude m-xylydine 43% triethylamine
Thrust.....	Initial 270 lbs. to 315 lbs. falling off progressively to 45 to 68 lbs. after 30 seconds.

\*Not verified.

RESTRICTED

OFFICE CHIEF  OF ORDNANCE

1 August, 1945