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TECHNICAL REPORT NO. 533-45

GERMAN NAVY MOORED MINESWEEPING

OCTOBER 1945

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GERMAN NAVY MOORED MINESWEEPING

SUMMARY

This report discusses the gear developed by the German Navy for moored minesweeping. This gear was limited in size by the policy of handling all gear by hand. The material for this report was obtained from the German Naval Experimental Mine Warfare Command (SVK) located in Kiel.

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and after part being shackled into the line with "neitschackles" which necessitates a lazy pendant or bight to be fastened around the cutter to maintain the continuity of the sweep wire when the cutter explodes. From trouble experienced with making up pendants, an angle iron V-shaped bracket was tried but was not successful and extremely hard to stow on the cable drum.

5. When recovering the sweep, the unused cutters must be closely examined to determine their condition before allowing them to come aboard. If the trigger arm has been pushed below the trigger guards springs, indicating that the shear pins have been sheared, an electric detonator is shackled to the line within the bight. The cutter is then re-streamed to approximately 10 meters astern of the ship and fired by means of the electric detonator. Many accidents have occurred from these Sprenggreifers exploding on deck. If the cutter is still in good condition it is brought aboard, the safety clamp replaced, the charge removed, the housing washed in fresh water and then stowed in its box ready for use in the next sweep.

6. These cutters are packed in a wood or steel box less charge and detonator in quantities of 10. The charges are packed in a felt-lined metal box and provided with a wooden form to prevent movement during shipment. These boxes are made to contain either 6 or 10 charges. The detonators are packed in the same manner as the charges.

7. The type D Sprenggreifer is practically the same as the B Sprengreiffer and is illustrated in plates 2 and 3. The type D Sprenggreifer was developed in 1940 and 1941 when the need for additional safety was apparent. While redesigning this cutter the explosive charge was increased to 200 gr of TNT. No reasons for increasing the charge could be found except the thought that our forces might use larger mooring cables.

8. The additional safety device incorporated in the type D cutter is a hydrostatically-actuated pin placed between the firing pin and the primer. When the cutter sinks to 6 meters, the water pressure pushes the pin back against a spring to a shoulder in the casting body. When the safety pin is against this shoulder a slot through the safety pin allows the firing pin to strike the primer when released. Upon recovery if the safety pin is showing the cutter is assumed to be safe. If the pin is not showing the cutter is detonated in the same method as for B cutters.

Section I (Cont'd.)

9. The handling, packing, streaming and recovery procedures for the D Sprenggreifer are the same as described for the B Sprenggreifer. The type D Sprenggreifer is the standard gear for sweeping cable-moored mines.

10. The introduction of chain moorings for mines necessitated the development of a special type cutter. In 1943 and 1944 a type E Sprenggreifer shown by Plate 4, was designed for this specific duty. This Sprenggreifer is now issued to the fleet but is used only when anti-sweep chain moorings are to be swept. This Sprenggreifer has only one trigger arm but the whole of the explosive head acts as the trigger, thus giving close contact between the charge and the mooring. The arm is on one side of the cable and the charge is on the other. The same type of firing mechanism as for the B Sprenggreifer is used with the ball-release guide being fastened to a vice type wire clamp. The explosive charge streams forward with the sweep wire running through the trigger arm to hold the Sprenggreifer close to the sweep wire.

11. This design still requires the use of a lazy pendant or bight around the cutter, as the sweep wire is parted when the charge detonates. However the necessity of shackling the Sprenggreifer in the wire is removed. Also, the design, by eliminating the trigger-arm guide, can accommodate any size mooring. The cable clamp is grooved for 14 mm wire.

12. The type E Sprenggreifer was designed to use a 500 gr charge of TNT. This charge will cut 22 mm stock standard link chain. When the mooring chains were increased in size to 30 mm stock having links up to 7.5 by 12.5 cm, an additional explosive housing was added to allow use of two charges totaling 1000 gr of TNT in one cutter. New designs permit increase of the charge to 1200 g.

13. The same safety devices are incorporated in the design of the E Sprenggreifer as for the D Sprenggreifer streaming and recovery procedures are also the same.

14. Another type of cutter called the Doppelschussiger Greifer is used by the German Navy for light and motor launch sweeps. This cutter is the type used by the French Navy and copied directly by the Germans immediately after the invasion of France. It is shown in Plate 5. This cutter is of the cartridge type with the charge driving a metal

Section I, Para. 14 (Cont'd)

blade against an anvil. The explosive charge is 15 g of black powder for each blade in cartridge form which is removed when the cutter is not streamed. The trigger is perpendicular to the sweep wire and is aft of the cutter blade. When the trigger is depressed the firing pin retaining pin is made to shear a collar and then to release the firing pin. The firing pin is spring-loaded and strikes a primer which detonates the charge.

15. Two cutters are attached to a stabilizing fin by means of two screws each. When one fires, its screws shear causing the cutter to drop off the fin thus freeing the path for the second cutter. The fin has a slot to attach the cutter to the sweep wire. The cutter is secured to the sweep wire loosely by two pins. Two bolt stoppers clamped to the sweep wire prevent the sweep from riding down the wire. One safety plate is used between the firing pin and the detonator. This is removed when streaming and replaced when recovered. This cutter will cut up to 14 mm diameter steel cable but will not cut chain because the opening will not permit chain to enter.

16. When recovering this cutter it must be checked to see if the trigger has caused the retaining pin to shear its collar. If it has, the assembly is thrown overboard. If not sheared the charge is removed the cutter washed in fresh water and stored for streaming again.

17. An additional French type of cutter used for light sweeps is exactly the same as the above except it has only one cutter per assembly and a correspondingly smaller fin.

18. A Sprengkrallengreifer similar to the B Sprenggreifer was developed before World War II for use with combination sweeps. A 500 gr TNT charge was used. The body had only two trigger arms and two trigger arm guides. The primer and detonator had a time delay incorporated in their design to give a delay after the trigger was pressed before detonating the main charge. This Krallengreifer also had a curved sheet-metal arm fastened to the trigger arm guide so that it closed the entrance to the trigger arm when the trigger was depressed, thus preventing a mooring cable from escaping. This Krallengreifer was streamed with a small float and attached to the sweep wire with a tension-release mechanism. When a mine mooring entered the Krallengreifer and pressed the trigger, the Krallengreifer would be freed from the sweep wire by the tension release mechanism and float up the mooring to the mine. It

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was desired that the mine would also explode. This Krallengreifer was used also without its charge in attempting to obtain enemy moored-mine anchors. It was thought, after the mooring had been secured within the trigger guide, the sweep wire could be hauled in with the fouled mooring. This was not successful and the use of the Krallengreifer was discontinued.

19. Two types of mechanical cutters have been developed for use with sweeping ships able to make 9 knots or better with gear streamed. These cutters are called the "Doppelgreifer" and the "Raumgreifer".

20. The "Doppelgreifer" or butterfly cutter is the wellknown German mechanical cutter. It was developed at the beginning of the war and with few alterations is the standard cutter used today. Plate 6 illustrates this cutter.

21. This cutter had a hard steel double blade on each side. These blades are of two types, the inside and outside blades. The cutter is inserted into the sweep wire and secured with neit shackles, one forward and one aft of the cutter. In use the flat shape stabilizes the cutter at sweeping speeds and causes it to lay flat in the water. Sweeping speeds of 9 to 16 knots must be maintained for proper cutting action but the preferred speed is 16 knots. At a speed of 9 knots this cutter will part the standard German 14 mm mine mooring cable. The life of this cutter is approximately 2 months, depending on the amount of sweeping and the care taken of it.

22. The Raumgreifer was developed to replace the Sprenggreifer in combination sweeps. It is shown on plate 7. This cutter is not in current use as the fleet did not like it. Difficulty was experienced in handling, streaming and recovery. This cutter has a blade approximately 18 cm long held within a steel casting. Fastened to the blade casting is a sheet iron stabilizing fin. The cutter is secured to the sweep wire by running the wire through a groove incorporated in the blade casting over the wire. The wedge must be driven onto the wire when streaming. When recovering this cutter, it must be removed from the sweep wire by driving out the wedge.

23. Due to the time consumed in streaming this gear it was not used as standard equipment even though it was slightly better due to its additional weight. The maximum size wire cut in tests with this gear was 14 mm.

SECTION II Floats, Otters, Depressors.

1. Previous to and during World War II the German Navy has captured or developed many types of floats, otters and depressors. However, after being confronted with the nedd for standardization, the shortage of material and the exhaustion of captured gear, they have now standardized on 5 float and otter combinations and 5 types of depressors. The old type gear and gear captured in Poland, France and other countries are used only when standard gear is not available.

2. The British size I float was obtained from a captured BYMS and tested. Several copies were made of this float but its issue was not made because of its size and the lack of handling gear on German minesweepers.

3. The M type float was developed for the German M type Minesweeper. It is illustrated in plate 8. The float is 3.79 meters long with a maximum diameter of .55 meters. The air weight of this float is 251 kg. The positive buoyancy is 306 kg. The volume of the float is 557 cubic decimeters. The thickness of the sheet metal used to make this float is 3 mm. It was designed to withstand a pressure of approximately 10 kg per square centimeter.

4. The K type float is somewhat smaller than the M float and was designed for use with JFRG magnetic sweeping cable. It is shown on plate 9. This float is 3.3 meters long and has a maximum diameter of .51 meters. It is constructed of 3.5 mm sheet metal. Its volume is 315 cubic decimeters. It was designed to withstand a pressure of 32 kg per square centimeter. The air weight of this float is 125 kg. The type K float is still widely used aboard fishing type minesweepers and M and R type minesweepers, even though the production was stopped because of the need to eliminate float types for material conservation and the wish to standardize types of floats.

5. A lighter float, the type R, was developed for use with the R class German Minesweeper. It is 2 meters in length having a maximum diameter of .48 meters. This float is constructed of 3 mm sheet metal. The volume is 231 cubic decimeters and the air weight is 93 kg with a positive buoyancy of 138 kg. This float will withstand a 19 kg per square centimeter pressure. It is used for all light sweeps on all types of German Minesweepers.

6. The S float was designed from a small Polish minesweeping float

Section II, Para. 6 (Cont'd.)

found to be the correct size for streaming the SSG magnetic sweep. It is used mainly for magnetic cable sweeps, rather than "O" sweeps. This float is 1.75 meters in length with a maximum diameter of .4 meters. This float is made of 2.5 mm sheet metal and it has a volume of 147 cubic decimeters, an air weight of 53 kg with a positive buoyancy of 94 kg. This float will withstand a pressure of approximately 20 kg per square centimeter.

7. The P type float was designed for motor launch sweeps. This float was patterned after the British size I float obtained from a captured BYMS. It is illustrated in plate 10. It has a length of 1.5 meters, a maximum diameter of .36 meters, and the air weight is 40 kg. The positive buoyancy is 48 kg, and the volume is 88 cubic decimeters. It is made of 2.5 mm sheet metal. It will withstand a pressure of 26 kg/square centimeter.

8. Three sizes of otters were standard with the German Navy at the end of the war. These were the M, R, and P types, for use with the floats of the same name, and for use with the type of gear usually streamed from the minesweeping ships of same name.

9. The M type otter is a direct copy of the French otter captured during the invasion of France with few improvements. Plate 8 illustrates this gear. It is a mono-plane otter 3 meters long having an air weight of 300 kg and a weight in water of 170 kg. The otter blade is 1.35 meters long and .73 meters wide.

10. The blade is made of 6 mm sheet steel. The legs between the blade and the stabilizing fin are made of angle iron offset for better stability. This otter is the largest used in German minesweeping.

11. The type R otter was developed for use with the type R float but is also used with the type K float where the weight to be supported warrants it. This otter is 1.5 meters long. It weighs 74 kg in air and 64 kg in water. The otter blade is 1 meter wide, .47 meters long and is made of 6 mm thick sheet steel. The legs between the blade and the stabilizing fin are made of pipe. The blade and fins are in direct line. This otter was a German design manufactured before the capture of the M type and was never changed.

12. The type P otter was designed for the motor launch sweep. The

SECTION II, Para. 12 (Cont'd.)

first design was a small copy of the type R otter which did not prove satisfactory. During the development of this gear a BYMS was captured. The BYMS multiplane otter design was copied. It is shown on plate 11. The multiplane otter is .53 meters long having 4 planes .53 meters wide and .11 meters long, made of 6 mm sheet metal. This otter has a 15 kg weight in air and 13 kg weight in water.

13. A type K otter was designed for use with the K floats but when tested was found to be extremely unstable. This otter was scrapped before issue to fleet.

14. Two types of diverter buoys were used by the German Navy for spreading magnetic cable sweeps. These floats were called type A & B, the difference being the size of the otter planes. They are illustrated on plates 12 and 13. These floats have however, been discontinued since standardization of manufacturing was desired. Trouble with the floats collapsing or springing a leak when a mine detonated near them made them undesirable.

15. Five types of standard depressors are used in German mine sweeping. These are the OGG, the TSG, the large wooden ridge type for M boat, the small wooden ridge type for Motor Launch and a steel ridge type for miscellaneous use.

16. The OGG is a float type single-plane depressor (see plate 14) made in two sizes which differ only slightly in design. The smaller has a volume of 132 cubic decimeters and 120 kg weight in air and a positive buoyancy of 12 kg. The larger has a volume of 175 cubic decimeters, a 138 kg weight in air and a positive buoyancy of 37 kg. Both have a length of 1.5 meters, a maximum diameter of 15 meters and are made of 3.5 mm sheet steel. The plane is 1.5 meters wide, .73 meters long and made of 6 mm sheet steel. The small OGG was developed before the war for relatively slow sweeping speeds and for pressures of 12 kg per square centimeter. When the German Navy was developing a destroyer sweep to escort convoys this depressor collapsed after 6 hours use at 34 knots. The larger OGG was then designed to withstand 45 kg prossure per square centimeter.

17. The TSG depressor is a smaller float type depressor designed for use with the ORG sweep. This depressor is 1.3 meters long with a maximum diameter of .42 meters. The air weight of this depressor is 68 kg.

Section II, Para. 17 (Cont'd.)

The positive buoyancy is 19 kg. The volume of the float is 88 cubic decimeters and it is made of 3 mm sheet steel. The depressing plane is 1.2 meters wide, .33 meters long and is made of 8 mm sheet steel. The float part was reinforced during the war to increase its pressure design for approximately 30 kg per square centimeter.

18. The largest type of steel reinforced wooden depressor is for the M type minesweeping ships. This depressor is ridge-shaped with a weight in the forward end. It is illustrated on plate 15. This depressor is 1.18 meters long and .45 meters wide. It weighs 70 kg in air and 34 kg in water. This depressor was developed before the war for use on M boats.

19. The small type of steel reinforced wooden ridge type depressor was developed for use with the R boats combination gear. This depressor is of similar design .75 meters long and .31 meters wide. It weighs 14 kg in air and 4 kg in water.

20. A ridge type depressor similar to the above design was made of 4 mm iron. It was developed in 1937 for use with the single ship diverted gear when the above wooden type was found to be unstable at the speeds required. This depressor is .85 meters long, 137 meters wide. It weighs 26 kg in air and 6 kg in water.

SECTION III Paravanes.

1. The German Navy uses two main types of paravanes, both for sweeping and bow protection. These types are the OR and the OLQ. The OR paravane was developed during the last war. The OLQ was developed during this war and is a new high speed, lighter type.

2. The OR paravane is used only on merchant ships, transports and other low-speed ships for bow protection. The slow converted fishing vessels and M boats use the OR paravane for sweeping. Seven knots is the minimum speed at which the paravane will maintain a stable depth. At 5 knots the paravane will start to submerge. Plate 16 shows this gear. The maximum cruising speed is 18 knots. This paravane is 3.1 meters in length, has a maximum diameter of .5 meters and a volume of 490 cubic decimeters. Its weight in air is 450 kg. The positive buoyancy is 40 kg. The body is fabricated from 5 mm sheet steel. The plane is 1.7 meters wide and .41 meters long and made of 6 mm thick steel. The depth setting gear is operated by use of the spring and diaphragm principle.

Section III. (Cont'd.)

3. The OR type paravane was found to be too heavy to handle for most minesweepers and small craft. This led to the development of the lighter type OLQ. The OLQ types are illustrated on plate 17.

4. The speed characteristics of the OLQ are the same as for the OR type. To obtain a lighter weight, the body of this paravane is made of 7 mm aluminum reducing the weight to 270 kg. The length remains at 3.1 meters, but the maximum diameter is reduced to .42 meters. The volume is 330 cubic decimeters. The positive buoyancy is increased to 60 kg. The plane is 1.6 meters wide and .43 meters long and made of 10 mm steel plate

5. The 18 knot maximum speed of the OR and OLQ types was found to be unsatisfactory for torpedo boat, destroyers, and other fast ships necessitating the development of a higher speed paravane. This modification was called the OLQI. The only change was to reinforce the plane struts, thus permitting a 24 knot maximum speed and a minimum stable speed of 8 knots.

6. Trials and experiments continued resulting in the OLQ II paravane which has a minimum speed of 9 to 10 knots for stable depth. The maximum speed has not been determined for this paravane. However, successful trials at 28 knots continuous speed have been made. One trial was made at 34 knots for 6 hours. The latter trial was terminated because vessels capable of towing this gear at high speeds were not made available. This paravane has the same general characteristics as the OLQ I modified by reinforcing the struts from the plane over the body and adding an additional bearing for the depth control mechanism.

7. The above OR and OLQ types of paravanes were developed for depth settings from 0 to 50 meters. A desire to increase the sweeping depth has recently led to the design of another spring to permit a maximum depth of 100 meters. The bodies are designed to withstand 70 kg per square centimeter.

8. The German Navy fit the paravanes with mechanical cutters. The OR, OLQ, and OLQ I type use a spring-loaded mechanical cutter which is set by the pressure of the mine mooring wire working against these springs. When the spring is loaded, it automatically releases and cuts the mooring. The OLQ II type paravane uses a two-bladed cutter made in a V shape.

SECTION IV Wire and Miscellaneous Gear.

1. The German Navy has developed two types of wire rope for sweeping. These types are the three-strand wire rope and the braided wire rope. Standard wire ropes are used for float pendants and miscellaneous uses in short lengths. A serrated wire rope was developed but seldom used.

2. The standard type of wire rope used for mechanical sweeping by the German Navy is a 14.3 mm diameter three-strand cable. Each strand of this wire is composed of 27 wires approximately 1.2 mm in diameter. This wire has a rated tensile strength of 14 tons. A special arrangement of stranding is used to obtain minimum hog or sag when in use. As an example, in a left hand lay wire the strands are left hand lay and the wires in the strands are right hand lay. Other advantages claimed for this wire are less kinking, fewer partings from abrasion, and greater safety in handling.

3. Float pendants are made of standard industrial flexible wire rope which is easier to handle and splice. The unlaying caused by strain is of little consequence since only short lengths are used.

4. This three strand wire is issued in 11 mm, 17 mm, and 22 mm diameter sizes as is necessary for strength.

5. A serrated wire rope was developed for high speed sweeping without cutters. This wire had a special hard steel strand interwoven in the standard sweep wire. Trials proved this wire to be unsatisfactory, as a minimum sweeping speed of 20 knots had to be maintained for effective cutting which gave the wire an extremely short life. Further development of this wire was discontinued because the special manufacturing procedure could not be justified in pressed German industry and because of the disapproval of this wire by SVK. The opinion of SVK was that their standard wire would cut effectively at the above minimum sweeping speed so that this development was not needed.

6. The second type of standard issue wire rope for sweeping developed by the German Navy is the braided wire. This wire was developed before the war mainly for use with their slow-speed combination sweeps as a neutral lay wire. It is at present used with their motor launch sweep when available. This wire is composed of 4 strands of small wire. These strands are interwoven or braided. Standard stock sizes of 7 mm and 9 mm diameters are issued.

Section IV (Cont'd.)

7. This braided wire has not been further developed for general use because manufacturing facilities were not available. It is difficult to manufacture and the German Navy seem to prefer forced sag rather than a flat sweep.

8. Position Buoys: The standard position buoy used is called the "Spurboje". This buoy consists of two cylindrical floats pointed forward and aft, each float being 1.1 meter long and .2 meter in diameter. These two floats are joined by two iron rods and two dynamic lift plates. The distance between the floats is .24 meter. For night sweeping a small battery light can be fitted to the forward plate.

9. Danning Buoys: Several types of buoys for danning are used by the German Navy. These buoys together with their characteristics are listed in the following chart, Page 15.

SECTION V - Sweeps.

1. Before the war the German Navy used many types of combination gear for sweeping moored mines which involved the use of two or more slow speed ships. This gear required complicated streaming and rigging procedures which necessitated good sea conditions for use. Furthermore once streamed most of these sweeps would sweep only one mine, and then have to be recovered and restreamed. Even for search sweeps it was necessary for two or more ships to be involved. These sweeps were used in the beginning of this war but soon discontinued due to their slow speed and extremely high loss of gear.

2. One type of sweep, the ORG, was developed before this war. This sweep is still in use. Details regarding it will be discussed later.

3. The German Navy used several definitions throughout their publications which will be used in the following discussions. These definitions are as follows:

a. Sweeping depth is the depth to the top of mines expected to be swept with certainty. The otter was assumed not to vary its depth more than ½ meter with float pendants 5 to 20 meters long, and 1 meter with float pendants 25 to 30 meters long, if the overall length between the top edge of the mine and the lowest part of the spring buffer is not greater than 1.5 meters.

Name	Buoy with Staff		Length of Staff		Anchor	Anchor Line			Conditions for use
	Weight	Buoyancy	Total mm	Above Water mm		Length of-m:	Dia: mm:	Type	
Fahrwasserboje Simple C/41	29	17	3600	1500	2 wts 25 kg ea	20	6.5	Steel	Depths to 40 m & 1 knot current.
Doppelboje C/41 without fins	49	38	3600	1500	1 wt-25 kg 1 wt-50 kg	20	6.5	Steel	Depths to 60 m & 3 knot current
Doppelboje C/41 with fins	51	37	3600	1500	2 wts 50 kg ea	20	6.5	Steel	Depths to 60 m & 3 knot current
Fahrwasserboje for deep water	29	17	3600	1500	2 wts 50 kg ea	100	6.5	Steel	Depths to 300 meters
Fischeriboje	70	28	8000	4900	2 wts 50 kg ea	100	6.5	Steel	For marking fields -
Zeitboje	54	30	3500	1500	2 wts 50 kg ea	90	6.5	Steel	For short time use. Sinks self in 0-12 hours.
Fahrwasserboje for 1 ship	81	54	——	1800	Auto with reel	5 reels 50 m ea.	5	Steel	For single ships use, anchor sinks 1-30 min after laying. Can be laid at 25 ks in a 3 knot stream.
Fahrwasserboje for small ship	22	15	——	1300	2 wts 25 kg	15m	2cm	Hemp cir	For hand launching from small boats
Fahrwasserboje for rivers	23.5	14	——	1200	2 wts 25kg ea & 1 20 kg 4 arm anchor	15m	2cm	Hemp cir	For use in rivers

FLOATED COMBINATION SWEEPS FOR 2 OR MORE SHIPS

Gear	Swept Path No. Ships	in meters	Speed in knots	Dia-mm sweep wire	Length-m sweepwire	Number and type of cutters	Sweeping depth in meters	Type of ship
100 MSG	5	300	7-13	7	300	None	2.5-17.5 1-17	M-Boat Fischdampfer Guhouy ship
100 MSuRG	5	300	7-13 7-15	7	245-270	1-Kr.Gr., 1spr Gr. or 1 Spr.Kr.gr.	2.5-17.5 1-17	"
150 MSG	5	450	7-13 7-14	7	325-340	None	1.5-17.5 1-15	"
150 MSuRG	5	450	7-13 7-14	7	325-340	1-Kr.gr, 1Spr Gr or 1 Spr.Kr.Gr.	1.5-17.5 1-15	"
250mMSG	5	750	7-11	7	610	None	1-13	"
150M TSG	5	450	7-13	7	650-689	None	3-47	"
150M TSuRG	5	450	7-12	7	480-485	1-Kg.fr. 1SprGr. or Sprkr. gr.	9-51	"
300m TSG	5	900	7-11	7	940	None	8.5-46	"
100m RSG	5	300	7-11	7	330-380	None	1.5-15.5	R-Boats
100m RuSG	5	300	7-11	7	270	1 Kr.gr. 1SprGr.	1.5-15.5	"
150m RSG	5	450	7-11	7	400	None	2.5-14.5	"
150m RSuRG	5	450	7-11	7	340	1 Kr.gr 1SprGr. or 1 Kr.Spr.Gr.	2.5-12.5	"
MPG	5	300	5-8	7	200	"	3-16	All ships incl. BB and CA
MJG	2	50	5-8	7	80	"	4-5	Torpedo boats & FD
* KSG		50	6-7	7	180	None	2.5-8.5	Motor Fischkutter
* KSuRG		50	6-7	7	130	1Kr.gr, 1Spr.Gr. or 1 Spr.Kr.Gr.	2.5-6.5	"
* FSG		50	3-9	7	180-260	32 Kr.Gr.	1.5-20	Fluszraumboote
* SuRG		400	5-7	16	820	None	4-20	M-Boats, Geleitboote, Fischdampfer
* Gr.RG		400	7	16	880	None	10-40	"
* Mehrfach Raumgerat		300	7-12	14	600	30 Doppelgreifer	4-30	M-Boats and R-Boats

* GROUND DRAG SWEEPS FOR ONLY 2 SHIPS.

Section V, Para. 3 (Cont'd.)

b. Standard practice for O gear sweeping is to stream both legs of a sweep. Therefore in this discussion it is assumed that both legs of two leg sweeps will be streamed. However, for special purposes single legs are used.

c. Where Doppelgreifers are specified for use, the Raumgreifer may be substituted.

4. An outline of the old combination sweeps is presented in the table on Page 16, with their principle characteristics. The abbreviations used in the chart are as follows:

MSG	Minensuchgerat
MS u RG	Minensuch u. Raumgerate
TSG	Tiefsuchgerate
RSG	Raumsuchgerate
RS u. RG	Raumsuch u. Raumgerate
MPG	Motorpinaszgerat
MJG	Motorjollengerat
KSG	Kerbsuchgerate
KS u. RG	Kerbsuch u. Raumgerat
FSG	Flugzsuchgerat
SWRG	Schweres Raumgerat
Gr. Rg.	Grund-Raumgerat
Kr. Gr.	Krallengreifer
Spr. Gr.	Sprenggreifer
Spr. Kr. Gr.	Sprenkrallengreifer m Verzogerung

Many variations for old river sweeps are listed which seemed to vary with the local and available gear. These will not be discussed as they are in principle the same as the types shown on the charts. Plates 18 through 25 illustrate some of these sweeps.

5. At present three major types of "O" gear sweeps are considered standard for moored minesweeping. These sweeps are the ORG, OGG and SDG sweeps. The terminology is determined by the gear used to veer the wire. The ORG uses the OR paravane, the OGG, the OLQ paravane and the SDG uses others. These sweeps use the various types of cutters depending on the mine to be swept and the sweeping speeds.

6. The SDG (Scherdrachenräumgerät) is the preferred type of moored-

Section V, Para. 6 (Cont'd.)

mine sweep. It exists in various classes which differ as to the type of component items of gear and ships which tow it. There are four main classes of this gear plus variations in these classes for specific tasks. These classes are the SDG/M, mainly for use by M-boats and Fischdampfers; the SDG/F, mainly used by Fischloggers, Fischkutters, and other converted sweepers capable of sweeping at 5 to 9 knots; the SDG/R the most-used class for M Boats, R Boats and other sweepers capable of sweeping from 9 to 16 knots; and the SDG/P for use by motor launches, self-propelled barges, and other craft having at least a 30 person capacity. The above classes are varied to use the sweeps for extra speed, for deep sweeping or as modified by the flotilla for any reason.

7. The SDG/R sweep is a sweep for all types of mine moorings depending on the cutter used. Plates 26 and 27 illustrate this sweep. It is suitable for use at speeds of 9 to 16 knots using Doppelgreifers and 9 to 12 knots using Sprenggreifers. The highest sweeping speed is stated to be most favorable. The maximum sweeping depth is given as 16 meters at 5 knots and 14.5 meters at 16 knots. The spread between the two legs using Doppelgreifers is 120 meters and using Sprenggreifers is 107 meters. The towing strain at 9 knots is 1009 Kg, 12 knots 1700 Kg and at 16 knots 2900 Kg. The sweep wire is standard 14.3 mm three strand wire rope 142-202 meters long when using Sprenggreifers, 152 - 194 meters long when using 5 Doppelgreifers, and 182 to 224 meters long when using 11 Doppelgreifers. A separate depressor line of from 90 to 110 meters of 11 mm diameter three-strand wire rope is used. This sweep uses the type R float, the type R otter and the type TSG depressor. Float pendants of 1, 2, 5, 10, 15, 20 and 30 meters are listed as standard issue for this sweep. The cutter combinations recommended for this sweep are 3 types, B, D, or E Sprenggreifers and one Doppelgreifer (connected to the otter) spaced 11.5, 16.5, and 16.5 meters from outboard end, 5 Doppelgreifers, one connected to the otter and the others spaced 6.65, 5, 5, 5, 10, 10, 10, 10, 10, 25 meters from the outboard end.

8. The SDG/R Tief sweep is the same as the above except the float pendant is increased to 40 meters and an additional type R float is inserted in the float pendant to provide extra buoyancy. An additional type TSG depressor or two iron ridge type depressors are added. This permits sweeping down to 31 meters at 5 knots or 24 meters at 13 knots. The preferred sweeping speed is 12 knots. Plate 28 pictures this sweep.

Section V (Cont'd.)

9. The SDG/R Geleitgerat (Convoy gear) is the same as the SDG/R sweep except 162 to 220 meters of sweep wire are used, giving spreads up to 130 meters. This gear can be used at speeds of from 9 to 16 knots with a maximum sweeping depth of 16 meters. Only one Doppelgreifer is used. This cutter is shackled directly to the otter. It is used only for search sweeps escorting convoys.

10. The SDG/R Doppel is the same as the SDG/R with 5 Doppelgreifers modified by the addition of a second section of 5 Doppelgreifers. (See plate 29). The original R float and R otter is placed at the outboard end of the inboard cutter section and an additional R float and Type R otter is placed at the outboard end of the outboard cutter section.

11. The SDG/M sweep is a sweep for all types of mine moorings determined by the number and types of cutters utilized. Plate 30 illustrates this sweep. It is suitable for a maximum sweeping depth of 37 meters. The spread between the two legs is given as 70 to 210 meters. The sweep wire used is standard 14.3 mm diameter three-strand wire 340 meters long. A separate three-strand depressor wire 11 mm in diameter from 90 to 215 meters long is used. This sweep uses the type M otter, type M float and OGG depressor. Float pendants of 5,10,15,20,25,30,40, 50 and 60 meters long, 9.5 mm in diameter are standard issue. When using over 25 meters float pendants two depressors must be used. Also one additional float must be added between the float and the otter, as in the SDG/R Tief sweep. This sweep uses cutter combinations of 6 Doppelgreifers, 11 Doppelgreifers, or 3 Sprenggreifers type B, D, or E, plus 1 Doppelgreifer at the otter. Spacings for these cutters are the same as for the SDG/R sweep.

12. The SDG/F sweep is primarily a sweep for cable moorings and small chain moorings (where the chain will fit into the cutter openings). Plate 31 is presented for details. It is suitable for use at speeds of 5 to 9 knots and for streaming up to approximately sea condition 4. The most favorable sweeping speed is 7 knots. Using same hand-lay wire at a 5 knot speed, a sweeping depth of 18.5 meters is expected while at 9 knots a 14.5 meter sweeping depth is expected. Using opposite hand-lay wire wire at a 5 knot speed a 23.5 meter sweeping depth is expected while at 9 knots a 16.5 meter sweeping depth is expected. Using 5 to 40 meter float pendants, spreads of from 160 to 130 meters are obtained between the two legs. The total weight of the entire

Section V, Para. 12 (Cont'd.)

sweep is approximately 1800 kg. Towing strain of the sweep is 900 kg at 5 knots and 2500 kg at 9 knots. The sweep wire is in three sections. The wire from the ship aft to the depressor is 120 meters 14.3 three-strand wire, and the two legs are each 160 meters of 11 mm diameter three strand wire. This sweep uses the type R otter, type R float, and type TSG depressors. Float pendants of 1,2,5,10,15,20, and 30 meters long of 9.5 mm in diameter are listed as standard issue. Cutter assemblies used with this sweep are 3 type B, D, or E Sprenggreifers per leg, spaced 10 meters apart starting 6 meters inboard of the otter. Using 6 Doppelschussgreifers, per leg they are spaced 5,1,5,10 and 15 meters running inboard from the otter, or standard combinations of Doppelgreifers.

13. For deep sweeping the SDG/F with an additional type P float is inserted in the float pendant between the R float and the otter as in the SDG/R Tief.

14. The SDG/P is the motor launch sweep for light sweeping in close shallow water. It is illustrated in plate 32. This sweep is only effective against cable moorings or such small chain moorings as will fit into the cutter opening. It is suitable for use at speeds of 3 to 8 knots but the speed should preferably be above 5 knots. This sweep can be streamed up to approximately sea condition 3. The maximum depth which this gear will attain is 23.5 meters at minimum speed or 15 meters at maximum speed. The spread is given as 70 meters between the two legs. The total weight of the gear with recommended spares is 600 kg. Towing strains are given as 80 kg at 3 knots, 400 kg at 6 knots, and 700 kg at 8 knots. The sweeping wire is in three sections. The wire from the boat to the depressor is 90 meters of 9 mm braided wire. Two 7 mm diameter braided sweep wires are connected at this point, one to spread to port and the other to starboard. These legs are each 130 meters long. This sweep uses type P floats, type P otters and the small type P depressor. Float pendants of 1,2,5,10,15 and 20 meter lengths, 8.5 mm diameter are standard issue. One Doppelschussiger or one Sprenggreifer per leg is the only cutter used with this sweep.

15. Streaming and recovery instructions for the SDG sweeps as written by SVK are presented in the following chart. This chart was translated from their written instructions.

Section V (Cont'd.)

SCHERDRACHENGERAT-STREAMING USING DOPPELGREIFERS

Preparations. The sections of the sweep wires with cutters spliced in are shackled to the sweep wires and wound on the winch drums. The bitter ends are connected to the otters and the float pendants connected to the floats and otters. The depressor is broken out. The dynamometers made ready with quick release hooks. The gear is then streamed as follows:

SHIP	OPERATION
Engine room orders are given from fantail	Starboard float is streamed and allowed to make float pendants taut.
Stop engine or slow ahead	Starboard otter is then slipped. Pay out sweep line slowly until float pendant is clear of rudder.
Steer straight course	Then pay out quickly until the scope of sweep line is 10 meters longer than the float pendant. Next stream the port leg in same manner.
Speed increased to 5 to 7 knots	Both sweep wires are paid out to their full scope. The inboard bitter ends are now made fast to the quick-release hooks shackled to the dynamometer.
Speed increased to 9 knots.	Depressor is streamed and depressor line is veered with correct scope. The depresser line is secured to the "Kline" grip. Bridge is notified that gear is streamed.

STREAMING PROCEDURE USING SPRENGGREIFER

Preparations. The section of sweep wire into which the cutters are shackled is faked out on deck, and the cutters are loaded and shackled into them. The outboard bitter ends are shackled to the Doppelgreifers which in turn are shackled to the otters. The float pendants are then shackled to the floats and otters. The dynamometers are made ready with quick release hooks. The depressor is made ready with pendants and shackled to the line. The gear is now ready to stream.

Section V. Streaming Procedure Using Sprenggreifer (Cont'd.)

SHIP	OPERATION
Engine Room orders are given from fantail. Stop engine short so that ship has extremely little way on.	The crew is stationed along starboard rail so as to be able to take a good hold on sweep wire. The starboard float is then streamed and allowed to make its pendant taut. The starboard otter is streamed. The armed section of the sweep is paid out hand over hand by the crew. Care must be taken that the crew pay out by holding lazy pendants. As the Sprenggreifers are veered 1 meter abaft the ship the safety spring is removed by pulling on its lanyard. After the last Sprenggreifer is streamed the sweep wire is fitted into the stern roller chock and paid out to the next center swivel. The port leg is then streamed in the same manner.

Carry on with streaming as when using Doppelgreifers.

RECOVERY OF GEAR WHEN USING DOPPELGREIFERS

Preparations. Engine room orders are issued from fantail. Ship is to steer straight course.

SHIP	OPERATION
Speed reduced to 9 knots.	Depressor line is removed from "Kline" grip. Depressor line hauled in and depressor recovered.
Speed reduced to 7 knots	Sweep wire is connected to winch and haul in both legs until center swivel is on deck.
Speed reduced to 5 knots	Haul in 50 meters additional sweep wire each leg.
Stop	Haul in port gear and bring otter aboard; recover float using pendant. Recover rest of starboard leg in same manner.

Notify bridge that sweep is recovered.

Section V (Cont'd.)

RECOVERY OF GEAR WHEN USING SPRENGGREIFERS

Preparations. Break out stowing boxes for cutter. Make ready electrically-fired detonators and battery. Prepare engine room to take orders from fantail. Ship is to steer straight course.

SHIP	OPERATION
Speed reduced to 9 knots	Depressor wire is removed from "Kline" grip. Haul in depressor wire and retrieve depressor.
Speed reduced to 7 knots	Both legs recovered as above to swivel.
Ship to have no way on, by reversing engine if necessary.	Port sweep wire is removed from stern chock. Haul in port sweep wire hand over hand by crew. Care must be taken to haul in wire by lazy pendants. Sprenggreifers must be inspected as soon as they surface to ascertain if they are safe. If not, carry out procedure outlined in Section I, para. 5, of this report. If safe, replace safety spring and bring aboard. Recover the additional line and otter. Recover float by using float pendant. Recover starboard leg in same manner.

Notify bridge that gear is recovered.

After gear is recovered the Sprenggreifers must be cared for as outlined in Section I, para. 6, of this report.

16. Of the two types of paravane sweeping gear the ORG (Otterraumgerat) is the oldest and the type used for both escort and clearance. Plate 33 illustrates this gear. The OR type of paravane is used for the outboard veer and depth control. As described in the gear section of this report, the OR type paravane is a slow speed unit and is used only on relatively low speed large ships, usually the M-boat and the Fischdampfers. At one time Sperrbrechers were fitted with this gear; however, difficulty was found in using these ships because of their size, high freeboard and lack of proper gear for streaming and recovery. In the early stages of the war, destroyers and torpedo boats

Section V, Para. 16 (Cont'd.)

were fitted out to stream this gear as an emergency sweep but were seldom called upon for this duty.

17. The ORG is a sweep for convoy escort or a sweep for all types of mine mooring depending on the type of cutter combination used. It is suitable for use at speeds between 10 to 24 knots when used as convoy gear, 9 to 12 knots using Sprenggreifers and 9 to 20 knots using Doppelgreifers. Due to short life of the paravane cruising at speeds over 18 knots, the recommended maximum speed is 16 knots. The maximum sweeping depth as convoy escort gear is 35 meters, using Sprenggreifers it is 34.5 meters and using Doppelgreifers it is 39 meters. The spread obtained when used as convoy gear is 112 to 140 meters, when using Sprenggreifers 53 to 128 meters and when using Doppelgreifers 66 to 140 meters. Standard three-strand 14.3 mm diameter sweep wire is used in lengths of 172 to 325 meters with Sprenggreifers, 204 to 337 meters with 5 Doppelgreifers, and 234 to 352 meters with 11 Doppelgreifers. A separate depressor wire 11 mm in diameter three-strand wire from 90 to 215 meters long is used, the length depending on the required depth. The depressor used with this sweep is the type TSG. A position-indicating buoy, the Spurboje is towed from the paravane to indicate the spread. The component mechanical spring-loaded cutter of the paravane is always used for the protection. A guide line for mine moorings is provided to guide the mooring into the cutter. When this sweep is used as convoy escort, no cutters are used in the sweep wire, the shearing medium being the paravane cutter at low speeds and the abrasion of the mine mooring by the sweep wire at high speeds. When this sweep is armed each leg carries three type B, D or E Sprenggreifers incorporated in the sweep wire. When using Doppelgreifers with this sweep, sets of 5 are used for standard sweeping or sets of 11 are used for special sweeping. Spacing along the sweep wire for the above cutters is the same as for the SDG/R sweep.

18. The OGG (Ottergeleitgerat) is used without cutters in the sweep wire for high speed convoy escort duty and only as a search sweep. This sweep was designed for use by destroyers and torpedo boats. As this is only a search gear if a mine is swept ahead of the convoy, the convoy must anchor or lay to while other gear is broken out and a path swept and buoyed through the minefield. This gear was considered impractical and therefore was used very little. Two forms of the sweeps are listed. The standard form uses two sweep legs from the ship out and a separate depressor wire. The simple form uses one

Section V, Para. 18 (Cont'd.)

wire from the ship to the depressor connector block, a pendant to the depressor and two sweep legs out from the depressor connection block. These types are shown on plates 34 and 35.

19. The OGG sweep is suitable for use from between 11 and 31 knots. It will sweep to a depth of 43.5 meters. The spread obtained using the standard method is between 120 and 130 meters between the two legs and when using the simple form is 120 meters between the two legs. Three-strand sweeping wire 17.3 mm in diameter from 380 to 430 meters long is used for the standard form with a depressor wire of the same type from 50 to 250 meters long depending upon the sweeping depth. For the simple form, a single 225 mm three-strand wire (from 50 to 140 meters long depending on the desired depth) is used from the ship to the depressor connection block. The depressor pendant is 1.5 meters long and 14.3 mm in diameter. Each sweep leg is 150 meters long and 14.3 mm in diameter. This sweep uses the type OGG depressor and the OLQ I or OLQ II paravane. The only cutter used is the component cutter of the paravane, the sweeping medium being the abrasion of the sweep wire at high speeds and the paravane cutter at low speeds. The Spurboje position buoy is towed from the paravane to indicate the spread.

20. Streaming of the ORG and the OGG sweeps are practically the same as for the SDG sweeps.

21. For use with the previously discussed sweeps, several standard lengths of sweep wire are made up with either Doppelgreifers spliced into the sweep wire or with provisions for inserting Sprenggreifers. These units are made up either at factories or at sweeping bases and issued complete. The standard issue is the same for all sweeps using the 14.3 mm diameter three-strand wire. The spacings given are from the outboard end.

a. With 5 Doppelgreifers:

End Doppelgreifer, 5 meter pendant, swivel, 1.65 meter pendant, Doppelgreifer, 10 meter pendant, Doppelgreifer, 25 meter pendant, Doppelgreifer, 25 meter pendant, Doppelgreifer, 25 meter pendant and a swivel.

b. With 11 Doppelgreifers:

End Doppelgreifer, 5 meter pendant, swivel, 1.65 meter pendant, Doppelgreifer, 5 meter pendant, Doppelgreifer, 5 meter pendant, Doppelgreifer, 5 meter pendant, Doppelgreifer, 10 meter pendant, Doppelgrei-

Section V, Para. 21 (b)(Cont'd.)

fer, 10 meter pendant, Doppelgreifer, 10 meter pendant, Doppelgreifer, 10 meter pendant, Doppelgreifer, 10 meter pendant, Doppelgreifer, 25 meter pendant, Doppelgreifer, 25 meter pendant, swivel.

c. With 5 Doppelgreifers - mixed lay:

End Doppelgreifer, 5 meter opposite hand lay pendant, swivel, 1.65 meter pendant, Doppelgreifer, 10 meter opposite hand lay pendant, Doppelgreifer, 25 meter same hand lay pendant and Doppelgreifer, 25 meter opposite hand lay pendant, Doppelgreifer, 25 meter opposite hand lay pendant and swivel.

d. With 3 Sprenggreifers B, D, or E:

One end Doppelgreifer, 5 meter pendant, shackle, 1.65 meter pendant, Sprenggreifer, 5 meter pendant, shackle, 5 meter pendant, shackle, 1.65 meter pendant, Sprenggreifer, 5 meter pendant, shackle, 5 meter pendant shackle, 1.65 meter pendant, Sprenggreifer, 5 meter pendant, and shackle 5 meter pendant, swivel around the 1.65 meter pendant above the Sprenggreifer, the Sprenggreifer and the 5 meter pendant and just forward of it a 10 meter lazy pendant is shackled in to prevent the sweep wire from parting when a Sprenggreifer is detonated.

e. With 3 Sprenggreifers E:

One end Doppelgreifer, 5 meter pendant, shackle, 1.65 meter pendant, 5 meter pendant, (to which Sprenggreifer E is clamped), shackle, 5 meter pendant, shackle, 1.65 meter pendant, shackle, 5 meter pendant, and (to which Sprenggreifer E is clamped), shackle, 1.65 meter pendant shackle, 5 meter pendant, (to which Sprenggreifer is clamped), shackle, 5 meter pendant, swivel. Around the three combinations of 1.65 and 5 meter pendants to which the Sprenggreifer is clamped, a 10 meter lazy pendant is secured to prevent the sweep wire from parting when the Sprenggreifers are detonated. The 5 meter pendant to which the Sprenggreifers is clamped must be replaced before another Sprenggreifer can be inserted in the sweep. Where paravanes instead of otters are used, the end Doppelgreifer is omitted and the component cutter of the paravane replaces it.

22. For sweeping operations the various types of cutters are utilized under the following conditions.

a. Doppelgreifers.

The highest clearance speed is 18 knots and the minimum speed is

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9 knots for clearance of cable mine mooring 11 mm in diameter or more. It is not expected to clear chain mooring with these cutters.

b. Sprenggreifers B or D:

This cutter is used for clearance sweeps below 9 knots for cable mine moorings or for chain mooring which will fit into the trigger guide. It is however, to be noted that at speeds under 9 knots, the spread is reduced, and due to the weight, the sag in the sweep wire is greater.

c. Sprenggreifers E:

This cutter is utilized for clearance of all types of mine moorings at all sweeping spreads. Caution is to be exercised in specifying sweeps using this cutter due to the danger involved with the large explosive charge. Only when chain moorings are to be swept is this cutter to be used. Charge weights to be used are 500 g for chains up to 24 mm stock diameters and 1000 g for larger stock chain.

23. Many types of anti-sweeps devices and sweep obstructors have been used by the German Navy. These include the explosive obstructor, cutter obstructor, aircraft-laid cutter obstructor and the chain mooring for mines. The types described below are shown on plate 36. A short description of these obstructors are as follows:

a. Sprengboje D (Spr. B.D.)(Explosive obstruction):

The float for this unit is conical in shape and contains a charge of .8 kg of explosive. A booster buoy 45 meters below the explosive float is used for additional buoyancy. The maximum lengths of the anchor lines are 45 meters of 8 mm cable for the anchor cable above the booster buoy and 63.5 meters of 8 mm cable for the anchor cable below the booster buoy. The action of this unit is to part the sweep wire when the float is pulled over by the sweep wire. The trigger is mounted at the bottom of the float necessitating close contact between the sweep wire and the charge. The minimum water-depth in which this unit can be planted is 52 meters while the maximum is 160 meters.

b. Reiszboje (RB)(Cutter obstructor):

The float for this unit is conical in shape and is 1205 mm in length with a maximum diameter of 484 mm, weighs 30.2 kg and has a positive buoyancy at 90 kg in excess of the maximum weight. One of two anchor cables can be used with this obstructor, either 50 meters of 11 mm wire

APPENDIX "A"

Gear and Documents forwarded to the United States.

1. The following list of gear identified by their consignment tag numbers have been shipped to the U.S. Naval Mine Warfare Test Station, Solomons, Md. All the gear listed are component parts of "O" moored minesweeping.

Consignment Tag	Gear
1052	1 Coil ½" braided sweep wire.
1053	1 Coil ½" three-strand sweep wire.
1054	1 Section of cutter cable with 5 Doppel-greifers.
1055	1 Depressor - wood, ridge-shape small.
1056	1 DanBuoy Flag
1062	2 Type BKD(S) obstructors.
1063	10 Type B Sprenggreifers.
1064	6 Krallengreifer.
1065	6 Doppelgreifers.
1066	2 Doppelschussigergreifer.
1067	4 Raumgreifers.
1068	1 Depressor - iron ridge-shape small.
1070	1 Tension release mech 16 ton max.
1071	1 Tension release mech 22 ton max.
1072	1 Cable stop, vise type.
1073	4 Connecting blocks.
1075	1 Paravane body.
1078	5 Boxes of explosive cutter charges.
1100	1 OLG paravane.
3101	1 OLG I paravane.
3102	1 OLG II paravane.
3103	1 TSG Depressor.
3104	1 OGG Depressor.
3105	1 Experimental float type depressor.
3106	1 Experimental float.
3107	1 Experimental float.
3108	1 Type OR paravane.
3109	10 Type E Sprenggreifers.
3110	3 Doppelschussigergreifer.
3111	1 Type M otter.
3112	1 Type M otter.

Appendix A (Cont'd.)

Consignment Tag	Gear
3113	1 Type K otter.
3114	1 Slow-speed bow-protection depressor.
3115	10 Einschussigergreifer.
3116	Misc. Boatswain's Gear.
3117	2 Coils 14.3 mm three-strand sweep wire.
3118	2 Type P otters.
3119	1 C/41 Dan Buoy (delayed sinking anchor).
3120	1 C/41 Dan Buoy (delayed sinking anchor).
3121	1 Depressor, steel ridge type.
3122	1 Depressor, steel ridge type.
3123	1 Depressor, wood ridge type small.
3124	1 Depressor, wood ridge type small.
3125	1 Type P float.
5202	1 Experimental river sweep float.
5203	1 Experimental river sweep float.
5210	1 Mechanical obstructor cutter.
5211	3 Sets tail fins for consignment tag 5202.
7131	1 M size depressor wood ridge type.
7132	1 M size depressor wood ridge type.
7133	1 Type R float.
7134	1 Type R float.
7135	1 Type M float.
7136	1 Type M float.
7137	1 Type K float.
7138	1 Type K float.
7139	1 Type S float.
7140	1 Dan Buoy double float type.
7141	1 Dan Buoy double float type.
7142	1 Type P float.
7143	1 Type S float.
7146	30 Charges for Doppelschussigergreifer.
7147	10 Charges for type E Sprenggreifers.
7148	2 Coils 7 mm braided sweep wire.
7150	4 Anchor weights for Dan Buoys.
7151	2 Flag-staffs for Dan Buoys.
7152	1 Box lighting units for C/41 Dan Buoys.
7153	1 Large Polish type float.
7154	1 Large Polish type float.
7155	1 Small Polish type float.

Section V, Para. 23 (b)(Cont'd.)

rope or 100 meters of 9.5 mm wire rope. One to four mechanical cutters similar in design to the Raumgreifer are used with this unit, so arranged as to shear a sweep wire as it rides up the mooring. The minimum length of anchor cable with which this unit is used is 8 meters, the maximum is 100 meters. The maximum water depth is 100 meters.

c. The Bombenreiszboje (BRB)(Aircraft laid cutter obstructor):
The float for this obstructor is mounted in the mechanism end of a GC mine case inert loaded. The float is conical in shape. The excess positive buoyancy of this float is 56 kg. The mooring for this float is 39 meters of 11 mm wire rope plus 1.2 meters of 16 mm chain. Two mechanical cutters, same as in (b), are used. The maximum depth of water in which this unit is to be laid is 91 meters using the maximum mooring length of 40.8 meters. The minimum length of mooring to be used is 8 meters.

d. The Sperrschutzboje (EMR)(Chain obstructor):
This obstructor consists of an empty type EMC mine case which is moored with 50 meter of 16 mm chain or 45 meters of 20 mm chain plus the additional wire rope necessitated by the water depth. The mooring cables used between the chain and the anchor are a maximum of 200 meters of 12.5 mm, 300 meters of 11 mm or 43.0 meters of 9.5 mm. This unit is planted with a maximum of 50 meters from the buoy to the water surface. The minimum total length of mooring is 55 meters while the maximum is 480 meters.

e. Sperrschutzboje K (EMR/K)(Double chain obstruction):
Now this unit is similar to the above unit described in (d) except to being moored with a double chain and line. One of these moorings is shorter than the other and takes the mooring strain until cut, when the second mooring takes the strain. The short mooring from the float down consists of 20 meters of 16 mm chain plus 50 meters of 12.5 mm wire rope. This mooring cable is wound on the anchor drum. The longer anchor uses 35 m of 16 mm chain plus 25 m of 12.5 mm wire rope. The lower bitter end of this mooring is fastened to the anchor. This obstructor is for use in from 20-58 m depths plus the required depth of the buoy from the surface.

f. Anti-sweep mine moorings.
Several types of mine moorings incorporating anti-sweep devices are used in German mine warfare. These include using 1.5 m of 16 mm chain plus one cutter, and 6 m of 16 mm chain.

Section V (Cont'd.)

24. For sweeping the Spr. B.D., RB and BRB(S) obstructors the recommended procedure is to use the 11 Doppelgreifer sweep section and the deepest possible sweeping depth. This theory is based on the probability of cutting the obstructor mooring before the sweep wire comes in contact with the anti-sweep device. For chain obstructors it is designated to use type E cutters in an armed sweep. The experts at SVK had not developed any other method of sweeping these obstructors and did not seem to be interested.

25. No satisfactory sweep has been developed for the snag line mine. One sweep is to tow a bight of line between two motor launches. This sweep is extremely dangerous to the boats and can only be used in smooth water. Another is the use of one motor launch, when the sea is calm, to approach the end of the snag line, and secure small line to it. The boat then gets on and the small line is paid out until a safe distance is reached. The line is then pulled which detonated the mine. Both the above methods were admitted to be crude.

26. For sweeping formations, station keeping is done by following the otter buoy of the sweep ahead at a pre-determined distance. If this is impractical, a prism glass set to give a set distance when two lines painted on the senior ship appear to line up. These lines are 11 meters apart.

27. With the use of the sweeps certain methods of rigging the depressors are followed. For the OGG depressors on a double-leg sweep snatch blocks are secured so as to roll down the sweep wires. A 1 meter pendant is secured between each snatch block and a special connection block. The depressor towing wire is secured at its outboard end to this block. A 1.5 meter pendant is secured between the four-way connection block and the depressor. When deep sweeps utilise two of these depressors, they are rigged the same way, one inboard of the other. The TSG Depressor is rigged in the same manner except using 1 meter pendants throughout. The small ridge-shaped depressors are rigged with a 1 to 2 meter pendant from the cross block to the depressor bridle.

28. The otters are rigged with the float pendant secured on the plane outboard of the leg opposite the plane weight. The point of tow is the center of the bridle.

Appendix A (Cont'd.)

Consignment Tag	Gear
7156	1 Small Polish type float.
7157	1 Type A diverter float.
7158	1 Type A diverter float.
7159	1 Type A diverter float.
7160	1 Type A diverter float.
7161	1 Type 13 diverter float.
7162	1 Type 13 B diverter float.
7163	1 Type B diverter float.
7164	1 Type B diverter float.
7167	7 Doppelschussigergreifers.
7168	4 Links obstructor chain.
7170	1 Box Misc. Gear.

2. The following documents of "O" gear have been shipped to the United States. These documents are identified with their forwarding letter:

a. NavTecMisEu Confidential letter to CNO (OP-16-PT) 25 July 1945 S51(10/Ma) Serial 0677:
Enclosure (C), item (2)-Book #453 "Einschiffminen Buchergerate Handbook on single ships "O" gear sweeps and bow protection gear, dated 1940.

b. NavTecMisEu Secret letter to CNO (OP-16-PR), dated 30 May 1945 Serial 00164, transmitting minesweeping notebook of minesweeping officer attached to Norderneger Island.

c. NavTecMisEu Confidential letter to CNO (OP-16-PT) 8 August 1945, S81 (10/Ma), Serial 0781, covering the shipment of the following "O" gear handbooks on consignment tag 5213 to BuShips (Code 620).

The subject books are as follows:
Item:

(1) No. 343 "Alarmgerat 42". Alarm gear used to indicate when an "O" sweep has cut a mine. Descriptive data and wiring diagrams. Dated 1942.
(2) No. 98 "Minensuch-u-raumgerate fur alte Fischdampfer". Handbook on gear requirements of this vessel when outfitted as a

Appendix A.-(2)(Cont'd.)

sweeper. Lists gear and gives weights. Dated 1939.

(3) No. 659 "Minensuch-und-raumgerat suf Motorfischkutlern" Handbook giving complete data and instructions on old combination sweeps streamed by these vessels. Dated 1940.

(4) No. 38 "Nachveisung uber Laufende Arbeiten an den Sperrwaffen". Published list of changes in sweep gear requirements. Corrected to June 1941.

(5) No. 763 "Sperrschutzmittle" handbook on sweep obstructors used operationally giving principle characteristics. Dated 1944.

(6) No. 775 "ELM" Handbook on ELM type mines, mainly concerning characteristics of the mines but also gives effects of some sweeps on units. Dated 1944.

(7) No. 62 "Beschreibung und Bedienunggavorschrift fur das Ottergeleitgerate", Handbook giving complete data and instructions for the high speed paravane sweep gear used for convoy escort. Corrected to 1944.

(8) No. 55 "Abmahme und Kentrollfschrten", Instruction book on procedure in adjusting the depth control device for bow protection, paravane sweep gear and high speed paravane sweep gear, Corrected to December 1941.

(9) No. 189 "Registrier Apparat fur Ottercontrolfahrten" Handbook on recording device used when working with paravane depth control mechanisms. Dated 1943.

(10) No. 162 "Einschiff-Flussraumgerat" (EFG), Handbook on single ship river sweeps giving descriptions and instructions. Dated 1942.

(11) No. 132 "Flussuchgerat" (ESG), Handbook on "C" gear search sweep for rivers giving complete data and instructions. Dated 1941.

(12) No. 140 "Frammosischen Leichtes Ronarchgerat", Handbook on early type single ship sweep gear. Dated 1941.

Appendix A, 3 (Cont'd.)

d. NavTecMisEu Confidential letter to CNO (OP-16-PT), of October, 1945, S81-1(10/As), Serial 01217, forwarding the following books:

(1) M Dv. Nr 719 "Kurze Beschreibung und Bediemungsvorschrift der leichten Minensuch-und-raumgerate", Short description of old type light combination "O" gear sweeps. Dated 1941.

(2) M Dv Nr 356 "Minensuch-und-raumgerate", Early handbook old type on "O" gear sweeps and buoys. Dated 1937, corrected to 1942.

(3) M Dv Nr 652 "Geratesolle der Minensuch-und-raumgerate" List of gear issued for "O" gear sweeps. Dated 1942, corrected to 1945.

(4) M Dv Nr 720 "Einschiffsuch-und-raumgerate", Handbook describing single ship "O" gear sweeps. Tables for depth and spread control are included. Dated 1941 corrected to 1943.

(5) M Dv Nr 453 "Einschiffminenabwehrgerate", Handbook covering streaming details of single ship "O" gear. Dated 1941 corrected to 1943.

(6) M Dv.Nr 654 "Einschiff-Raumgerat fur Motorpinassen (SDG (P)) Handbook on Motor boat "O" gear sweeps. Dated 1942 corrected to 1943.

(7) M Dv Nr 774 "Scherdrechengerat fur Raumboote" Handbook on SDG/R sweep-single ship two leg "O" gear sweep.

(8) M Dv Nr 432 "Tietensteuerungstabellen fur Minensuch-u-raumgerate", Depth setting table for old O gear sweeps. Dated 1938 corrected to 1941.

(9) M Dv.Nr 337 "Fahrwasserboje fur Einschiffgerate" Handbook on a marking buoy with a delayed sinking anchor Type C/41. Dated 1942.

(10) M Dv Nr 646 "Eiserne Raumotter" Handbook describing the type or paravane. Dated 1940, corrected to 1944.

(11) M Dv Nr 649 "Vereinfachtes Ottergeleitgerat" Handbook

Appendix A, d (11)(Cont'd.)

on the "simple" (type OGG) high speed convoy escort "O" gear sweep. Dated 1940, corrected to 1944.

(12) M Dv Nr 772 "Bugschutzgerate", Description and instructions for streaming and care of bow protection gear. Dated 1944.

(13) Umdr. der SI Nr 191 "Scherdrachenraumgerate fur Minensuchboote", Handbook on the otter type two leg "O" gear sweep for M class minesweepers (SDG/M). Dated 1943, corrected to 1944.

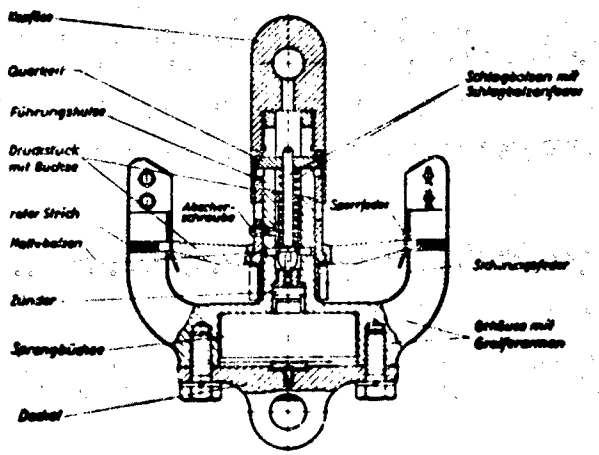
(14) Umdr. der SI Nr 193 "Abmessungen, Gewichte und Raumbedorf der Sperrwaffen einschliesslich Zubehor". List of various mines and minesweeping gear giving miscellaneous details.

Prepared by:

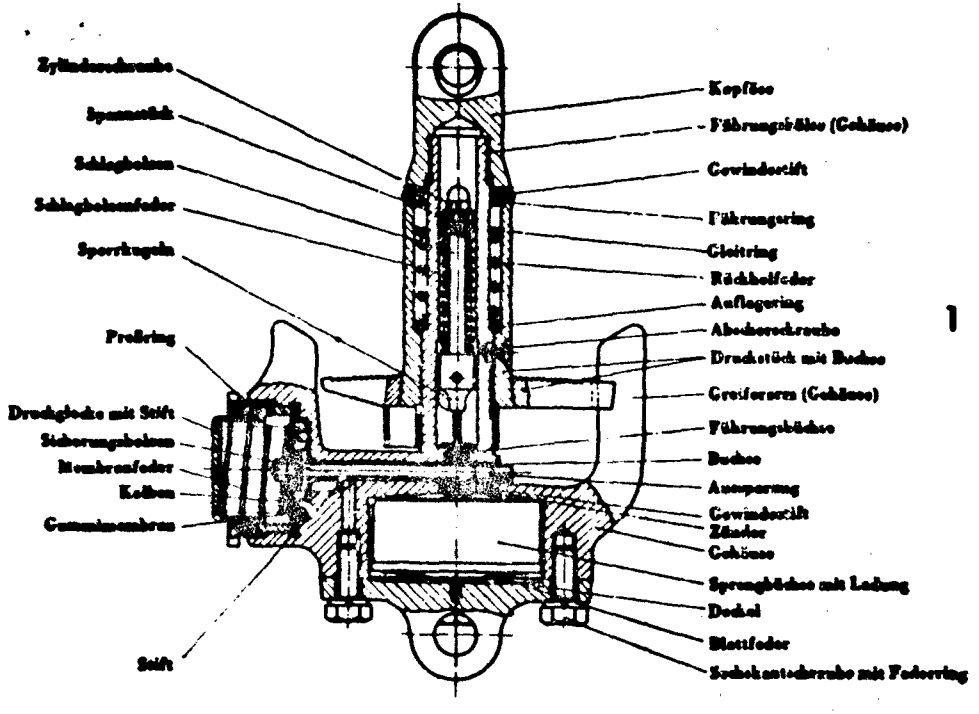
J. W. GOULD,
Lieut., USNR.

Drahtblatt 9 — Skizze 8

Sprenggreifer B



PLATT - 1

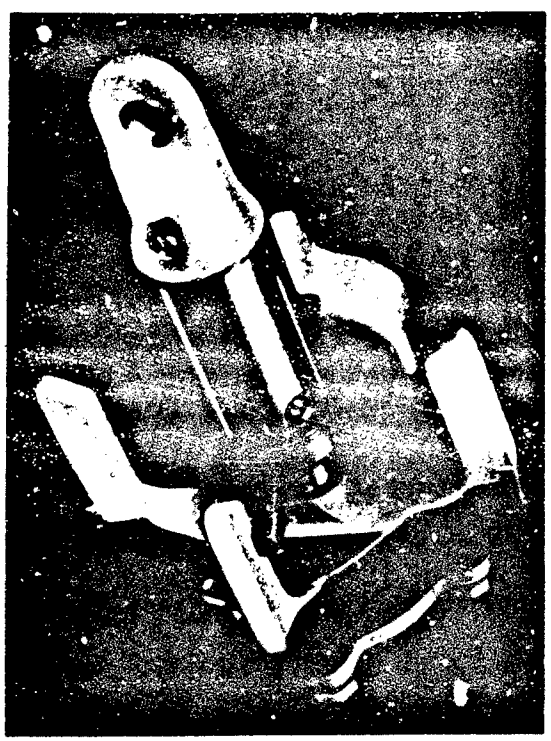


Sprenggreifer D

PLATE - 2

Bild 13,
Bild 13a,
Bild 13b.

13b.



TYPE "D" SPREDGREIFER

PLATE 3

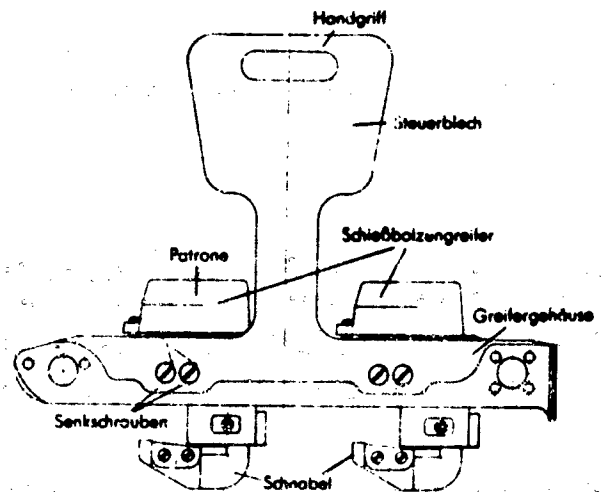
Bild 16,
Bild 16a,
Bild 16b.

16b.

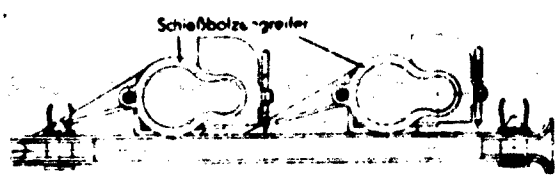
TYPE "E" SPRENGREIFER

PLATE 11

Anlage 6



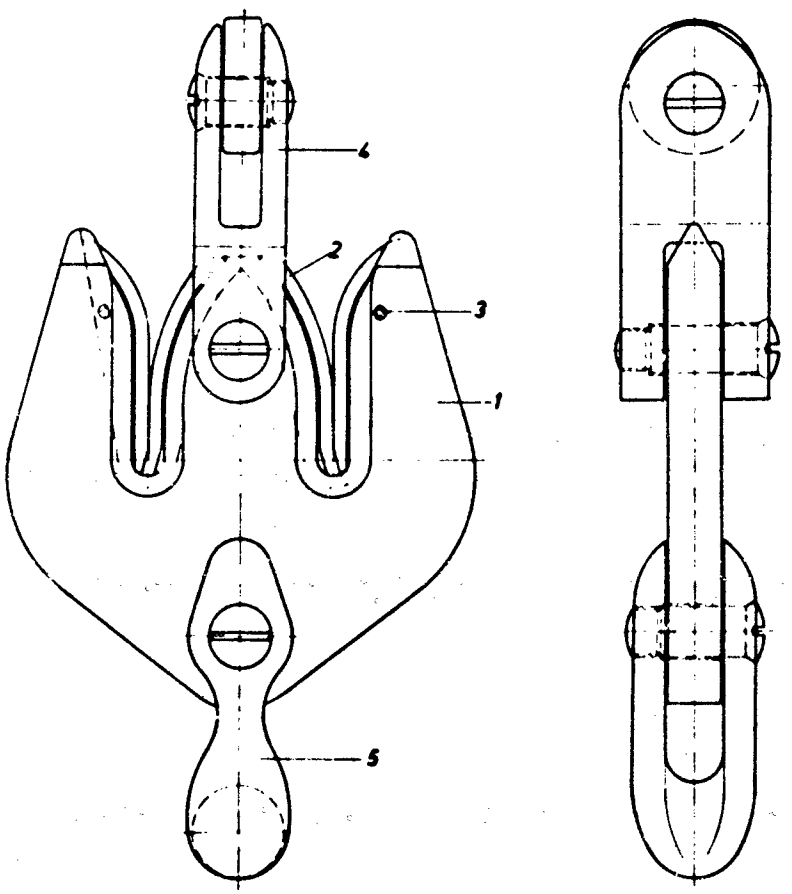
Doppelschiebriger Greifer



Greifergehäuse (Schnitt)

PLATE - 5

Abb. 17

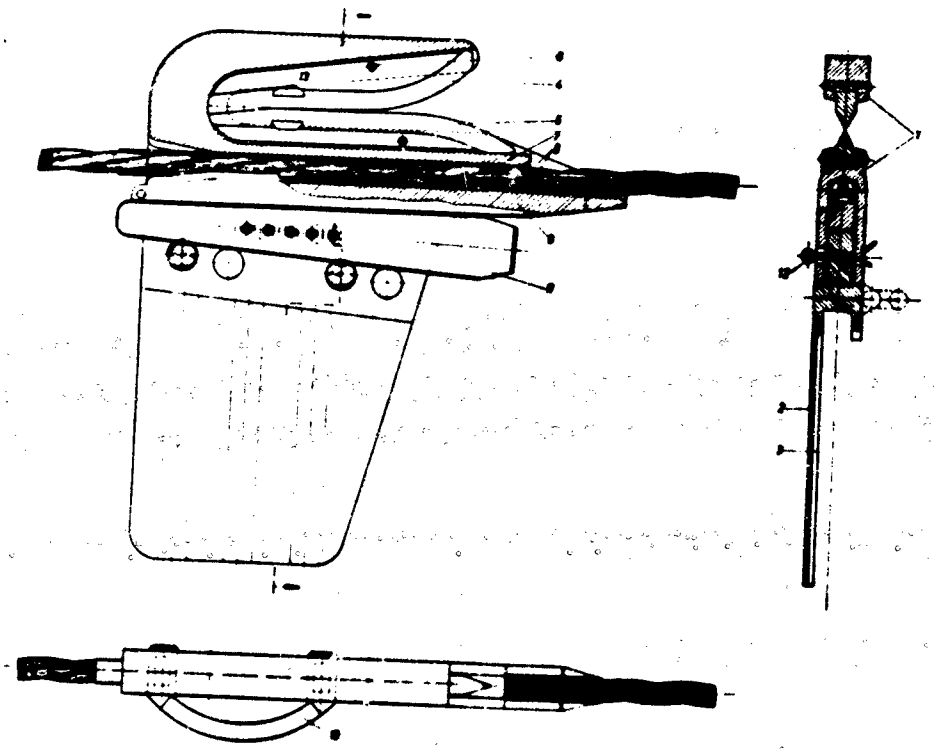


Doppelgreifer mit Schlitzhebel (Schnittzeichnung)

1 Gehäuse
2 Messer
3 Niete
4 Gabelschlitzhebel
5 Anschlußschlitzhebel

PLATE 6

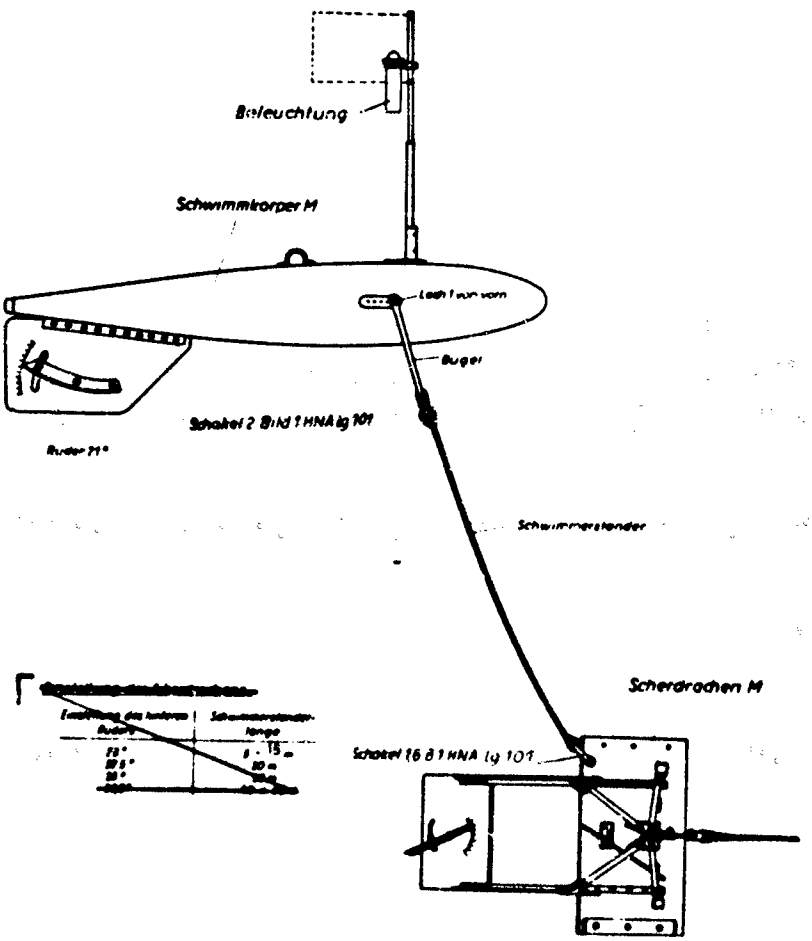
Abb. 13



Bürstgreifer (Schnittzeichnung)

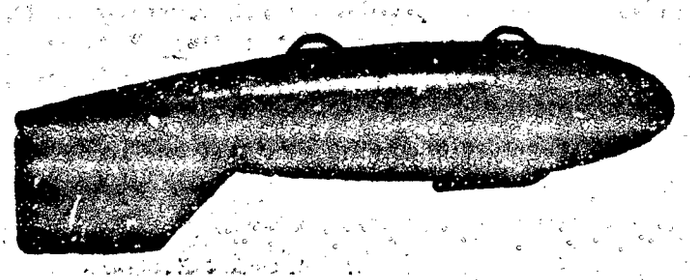
1 Gehäuse	8 Zinkeinlage mit Nase
2 Bremsblech	9 Buchse
3 Verstellung	10 Verriegelung
4 Oberes Messer	11 Keil
5 Unteres Messer	12 Splint
6 Korbstift	13 Einrichtung zum Herausnehmen der Messer
7 Zinkeinlage	

PLATE 7



Scherdrachen (M) und Schwimmkörper (M)
TYPE "M" OTTER AND TYPE "M" FLOAT

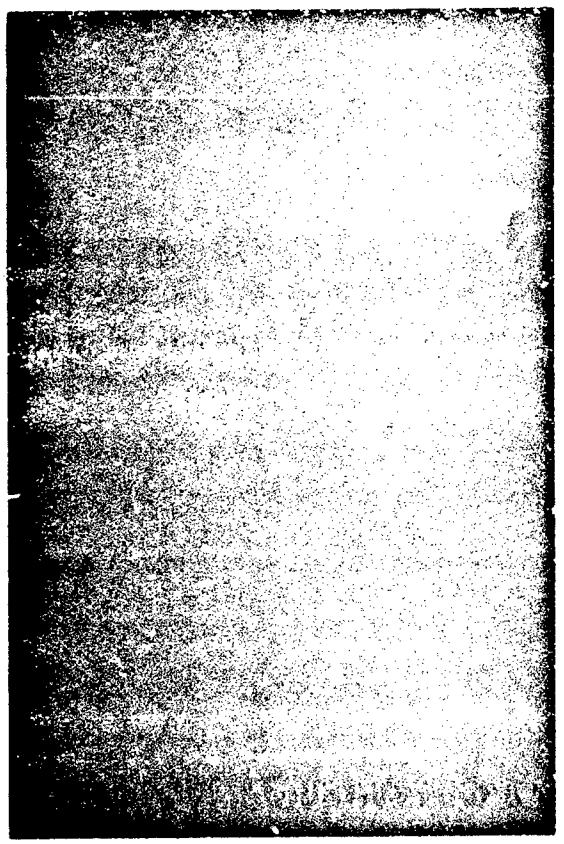
PLATE 8



Tragboje K
TYPE "K" FLOAT

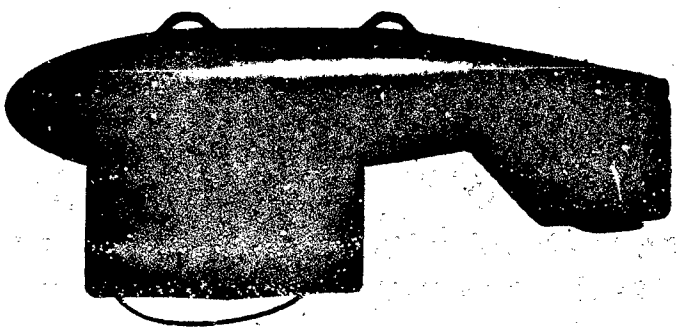
PLATE 9

Anlage 3



Seeadrachen (P)
TYPE "P" OTTER

PLATE 11

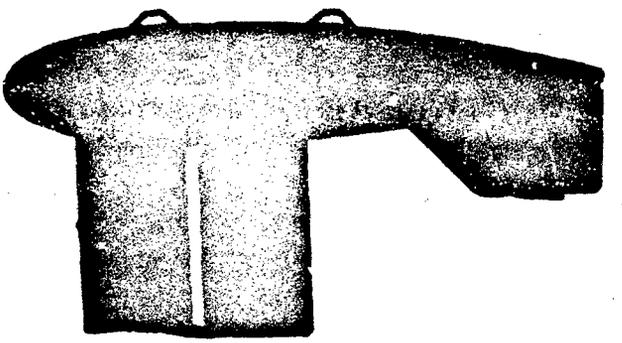


Scherbojo A
DIVERTER FLOAT "A"

PLATE 12

Deckblatt 8

Abb. 13 a



Scherboje B
DIVERTER FLOAT "B"

PLATE 13

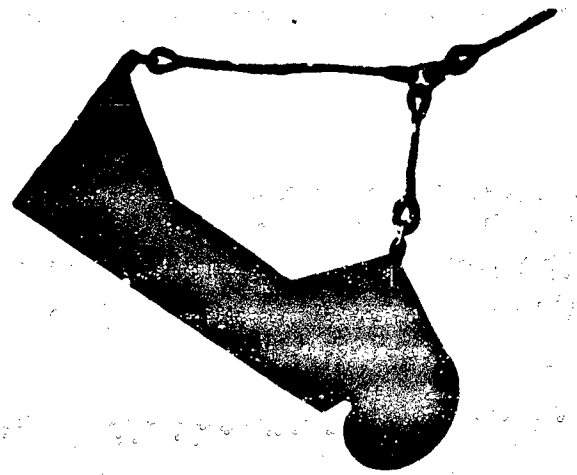


Abb. 7 Drachen

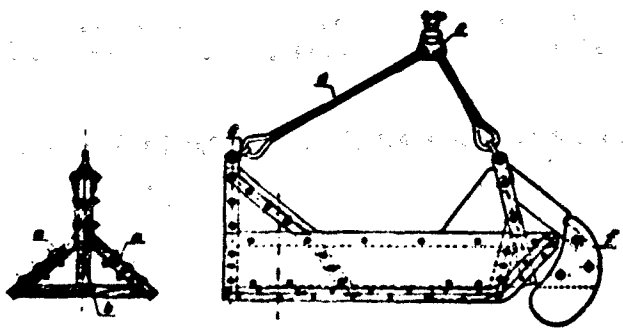


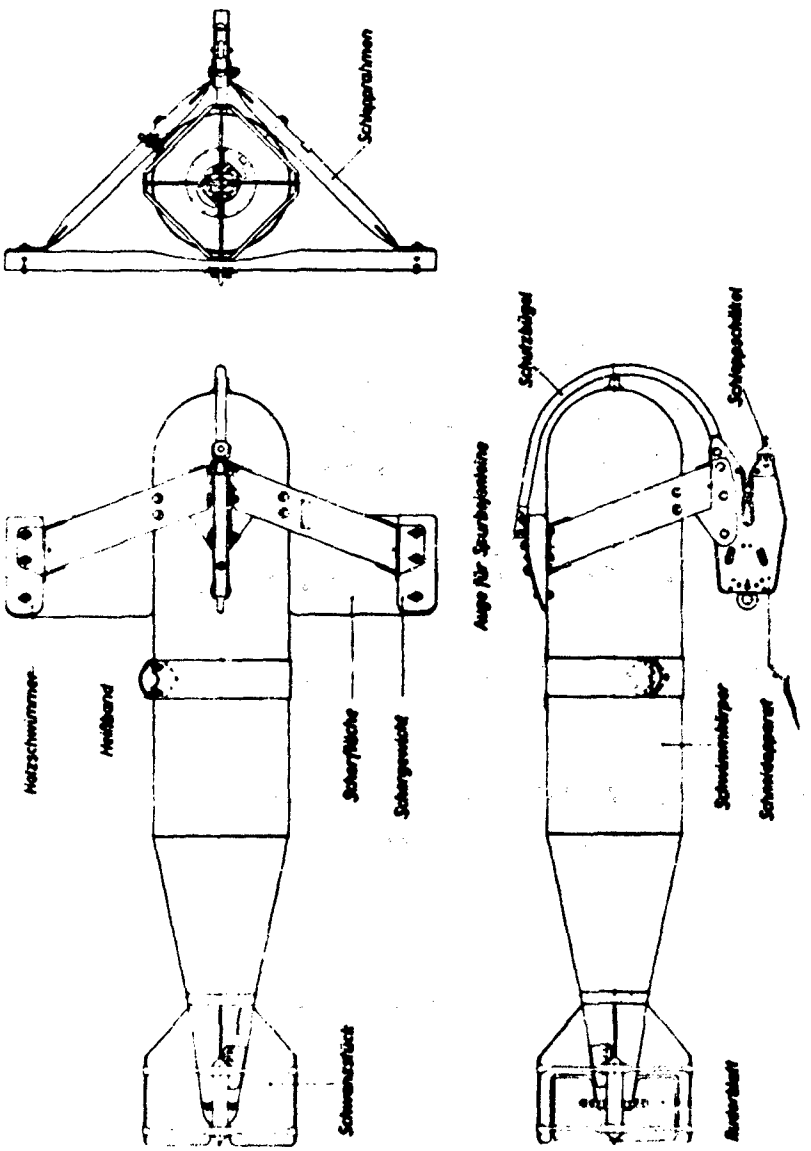
Abb. 8 Drachen (Zeichnung)

a) Seitenbretter
b) Mittelbrett
c) Schraubschäkel mit Splint
d) Drachenspann
e) Wirbelschäkel
f) Drachengewicht

WOODEN RIDGE SHAPED DEPRESSORS

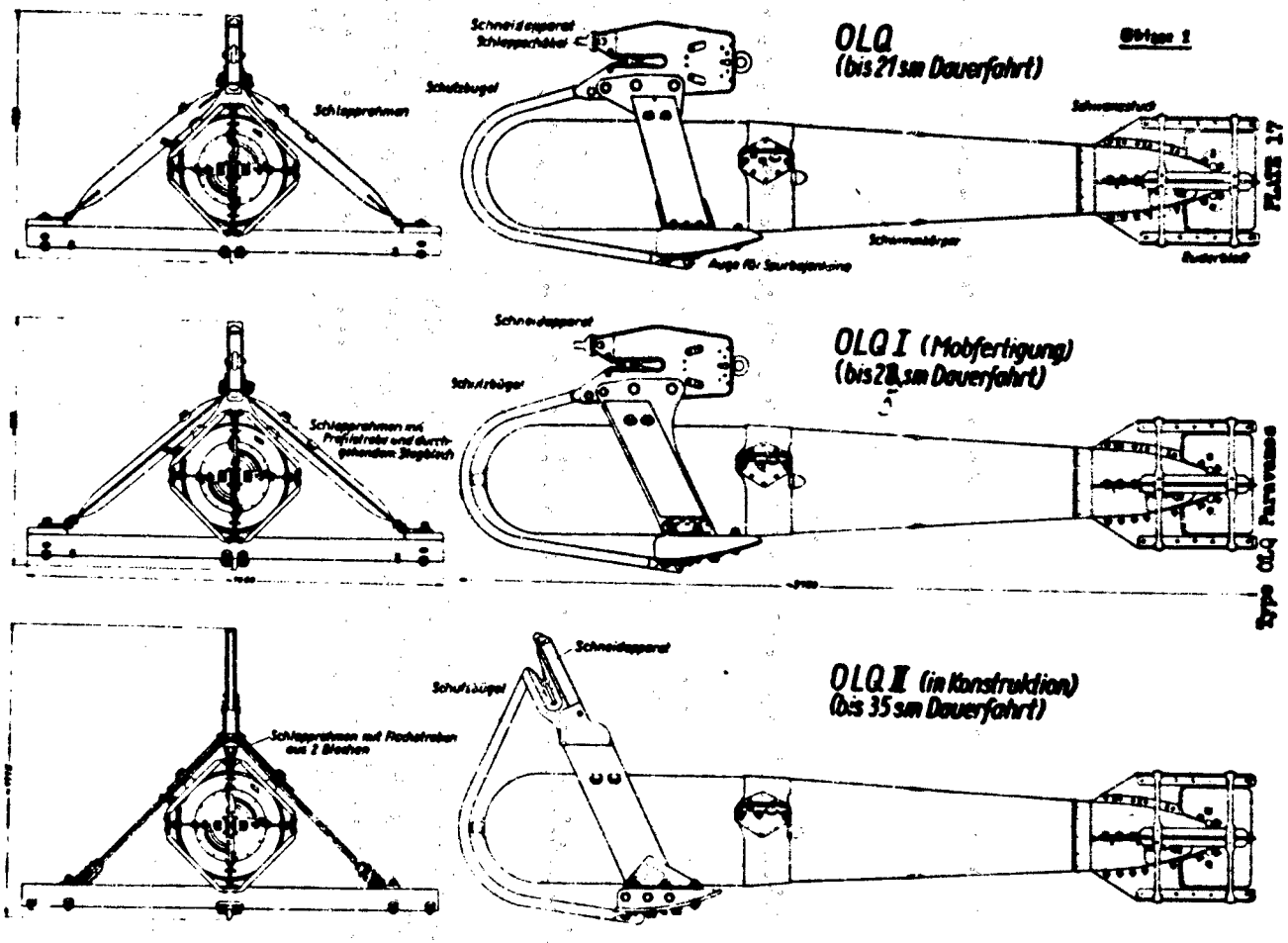
Bild 3

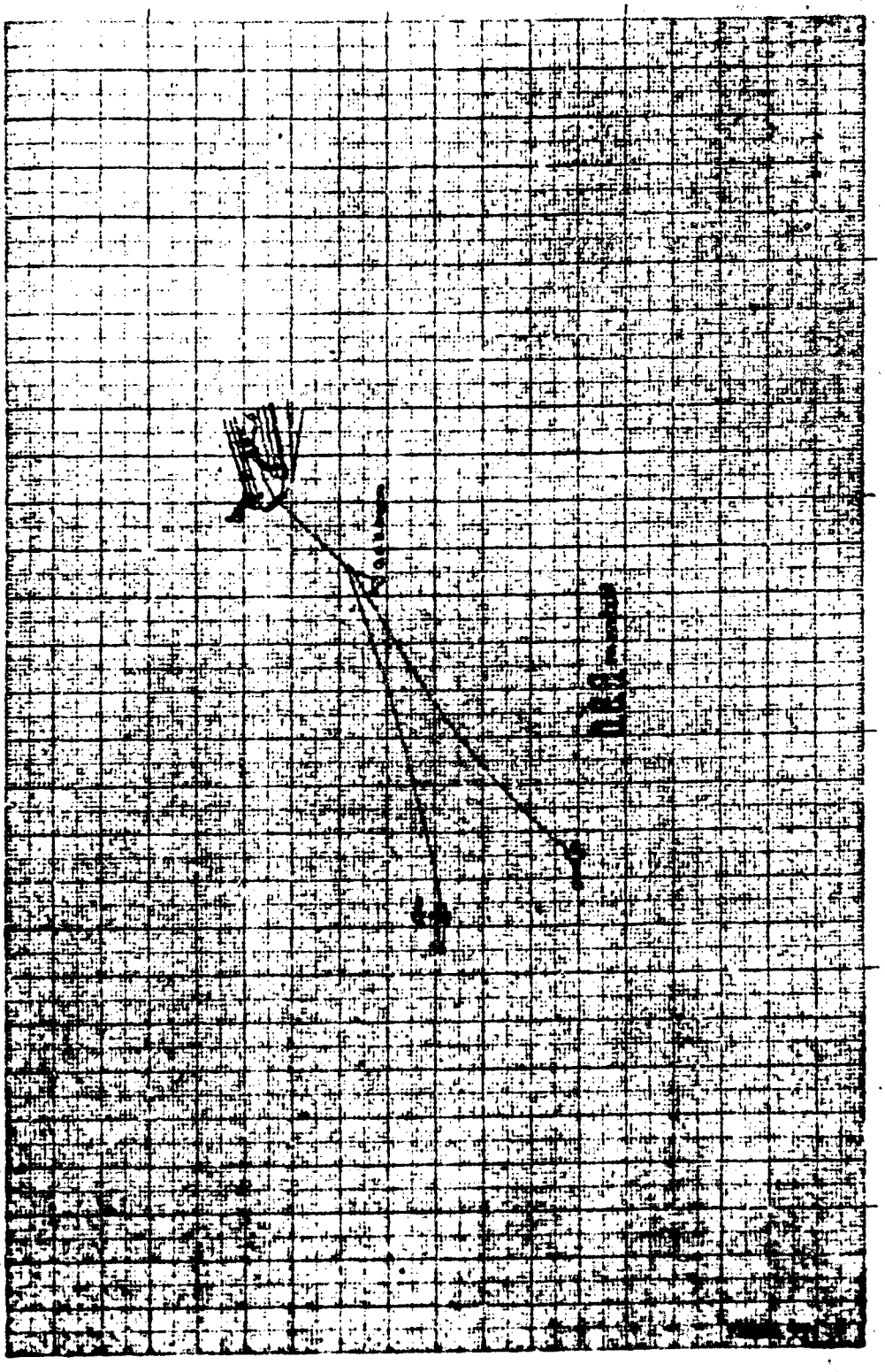
O.R. (als B.B.-Otter gezeichnet)



Type OR Paravane

PLATE 16


Schlepprahmen
Schneidapparat
Schleppschlitten
Schußbügel
Schwanzstück
Schwanzkörper
Auge für Spurbojenleine
Ruderblatt
OLQ
(bis 21 sm Dauerfahrt)
Bild 1
PLATE 17
Schlepprahmen mit Profileisenbau und durchgehendem Stegblech
Schneidapparat
Schußbügel
OLQ I (Mobfertigung)
(bis 28 sm Dauerfahrt)
Type OLQ Parawing
Schlepprahmen mit Rechteckrohren aus 2 Blechen
Schneidapparat
Schußbügel
OLQ II (in Konstruktion)
(bis 35 sm Dauerfahrt)



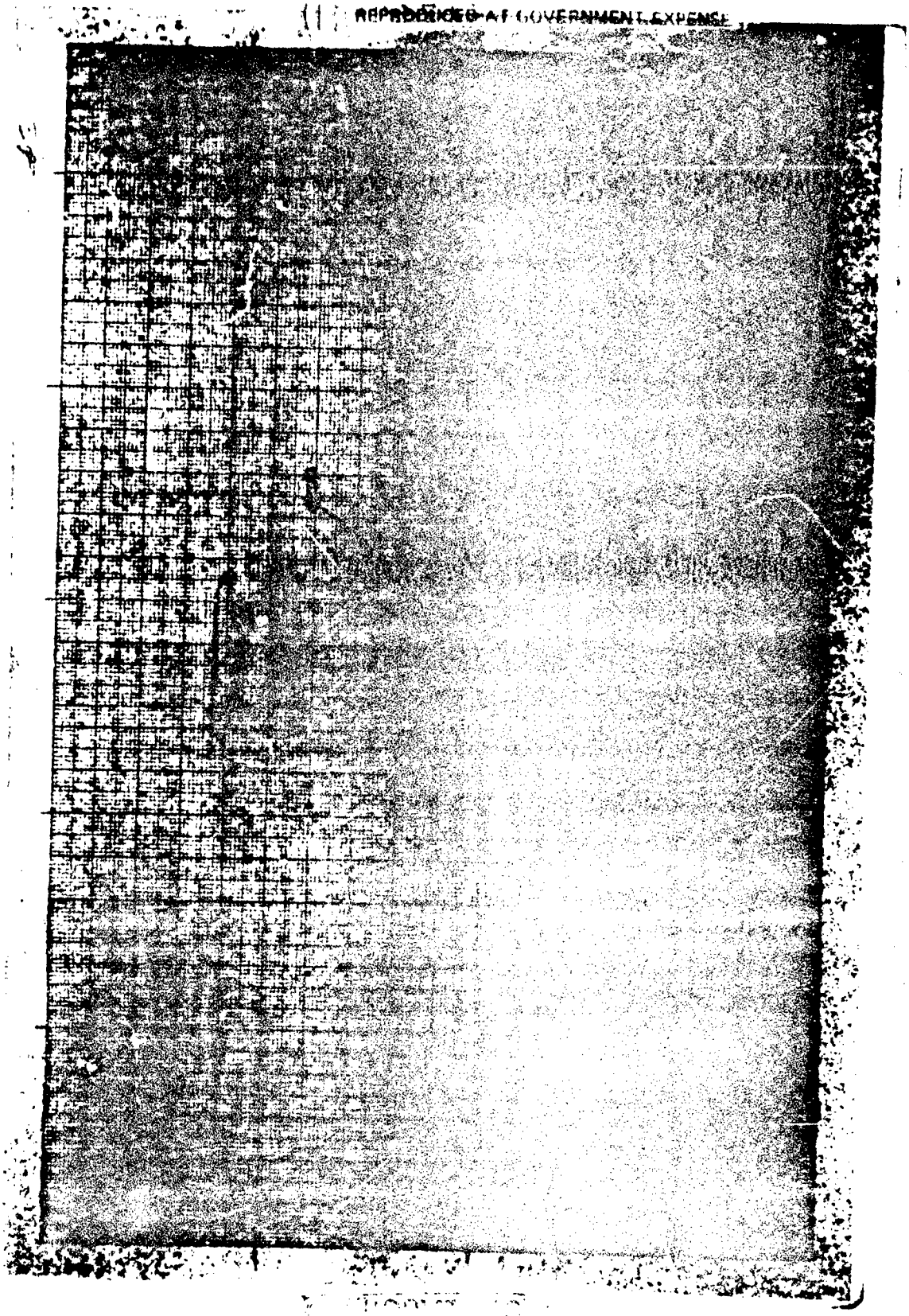
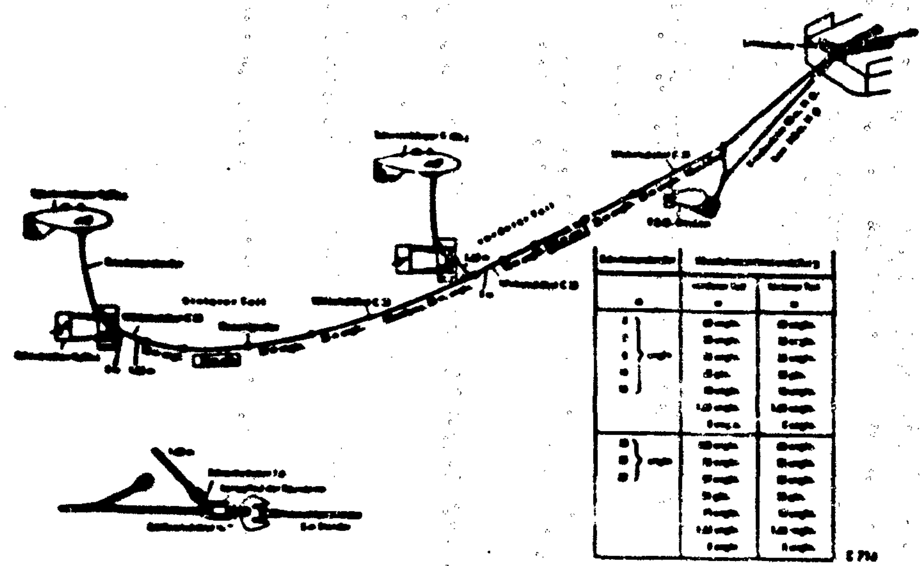


PLATE 30

PLATE 32

PLATE XI

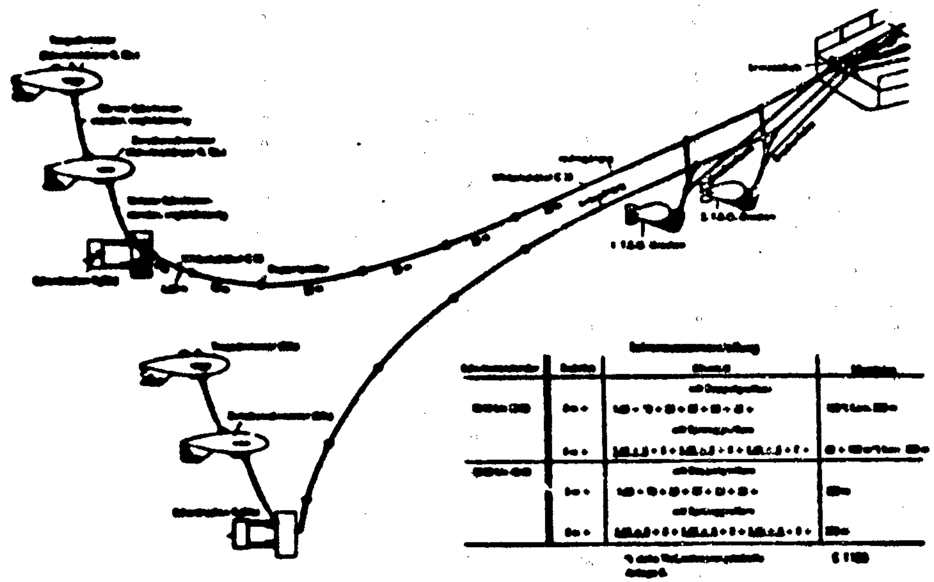


Doppel-S.D.G./R, einseitig
(gemischte Leinenanordnung, Bb.-Seite).

Bild 2.

PLATE 29

Bild 2.

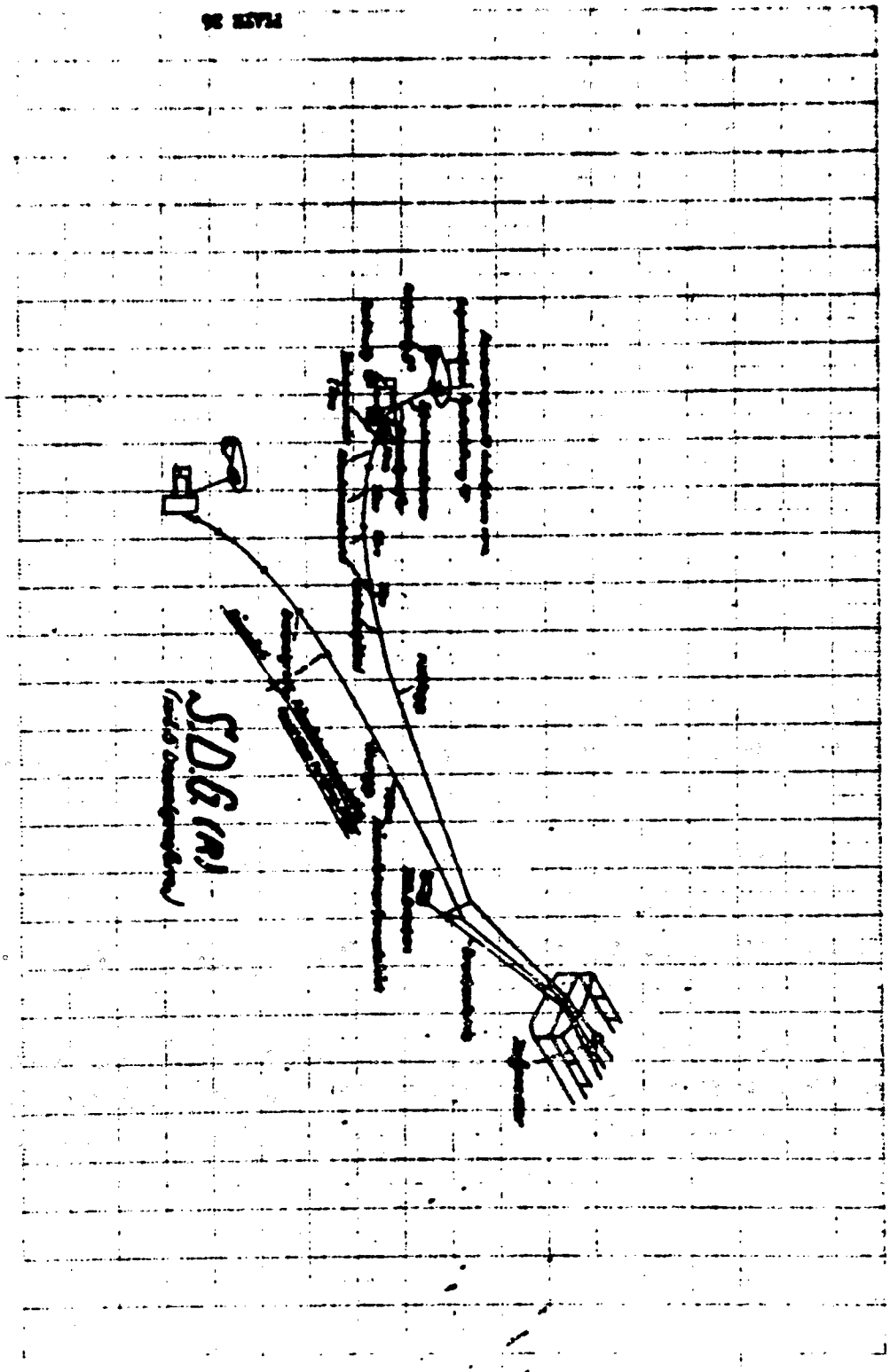


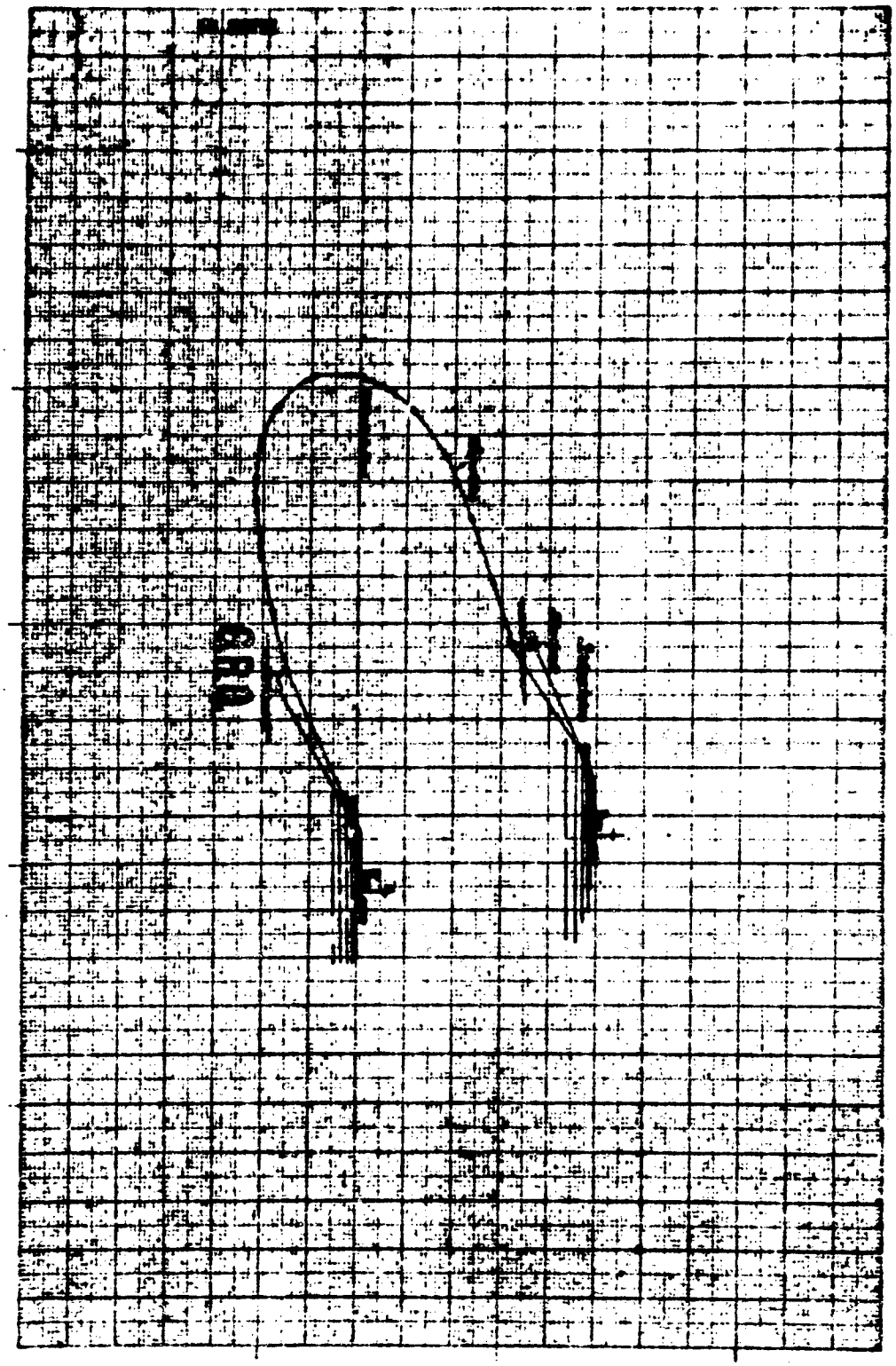
S.D.G./R. tief (ungleichmässig).

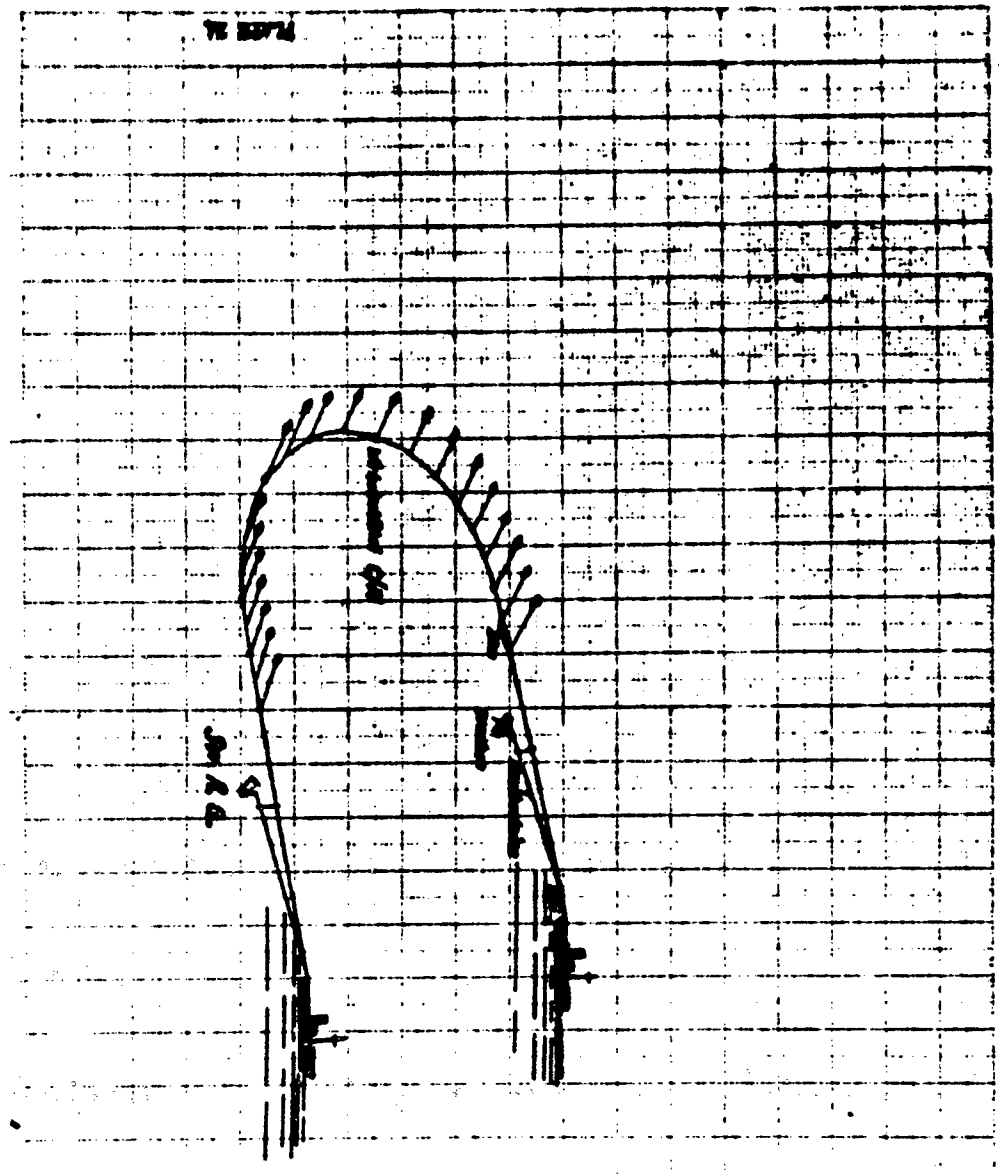
Bild 4.

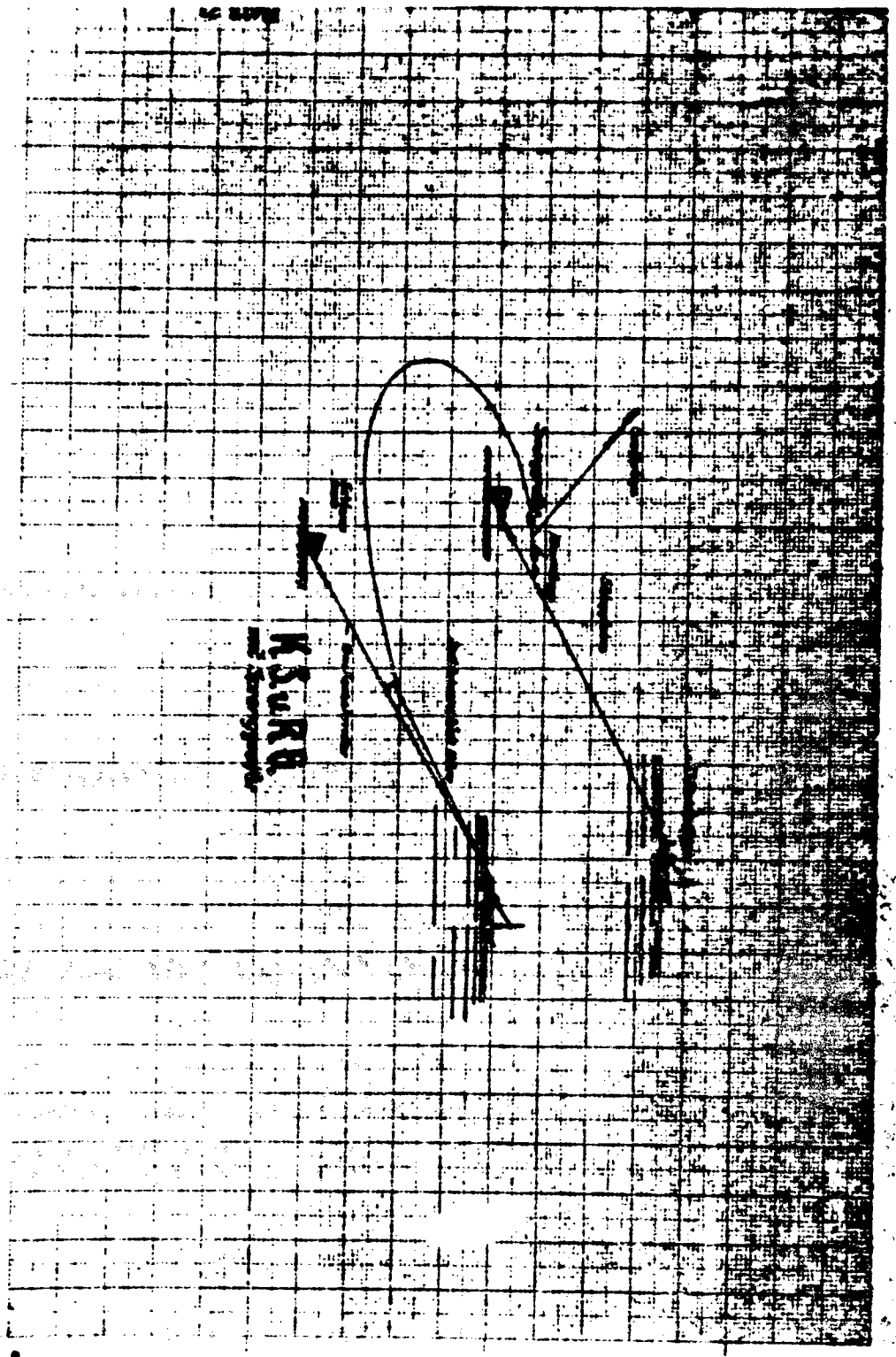
S.D.G./R mit Sprenggriffen, ungleichseitig

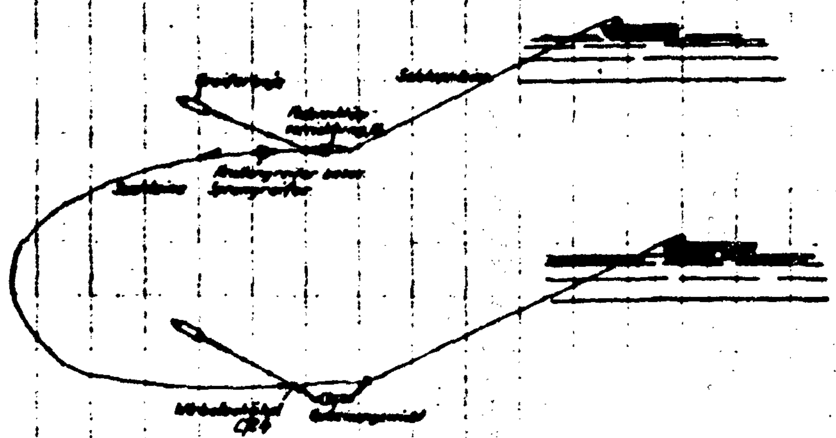
PLATE 27









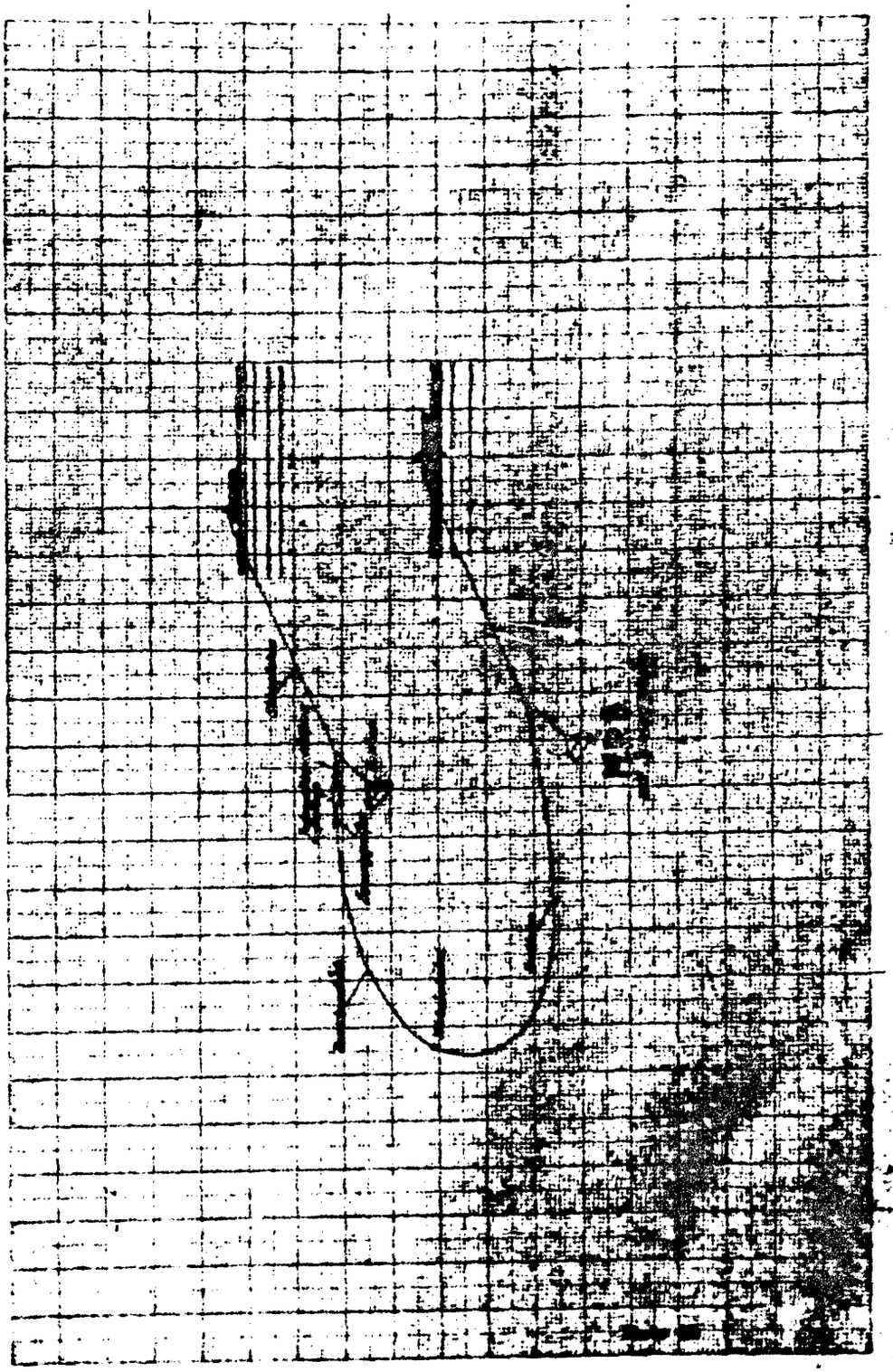


M.J.G.

(mit Hr. Gr. Bearb. Spr. Gr.)

PLATE 22

REPRODUCED AT GOVERNMENT EXPENSE



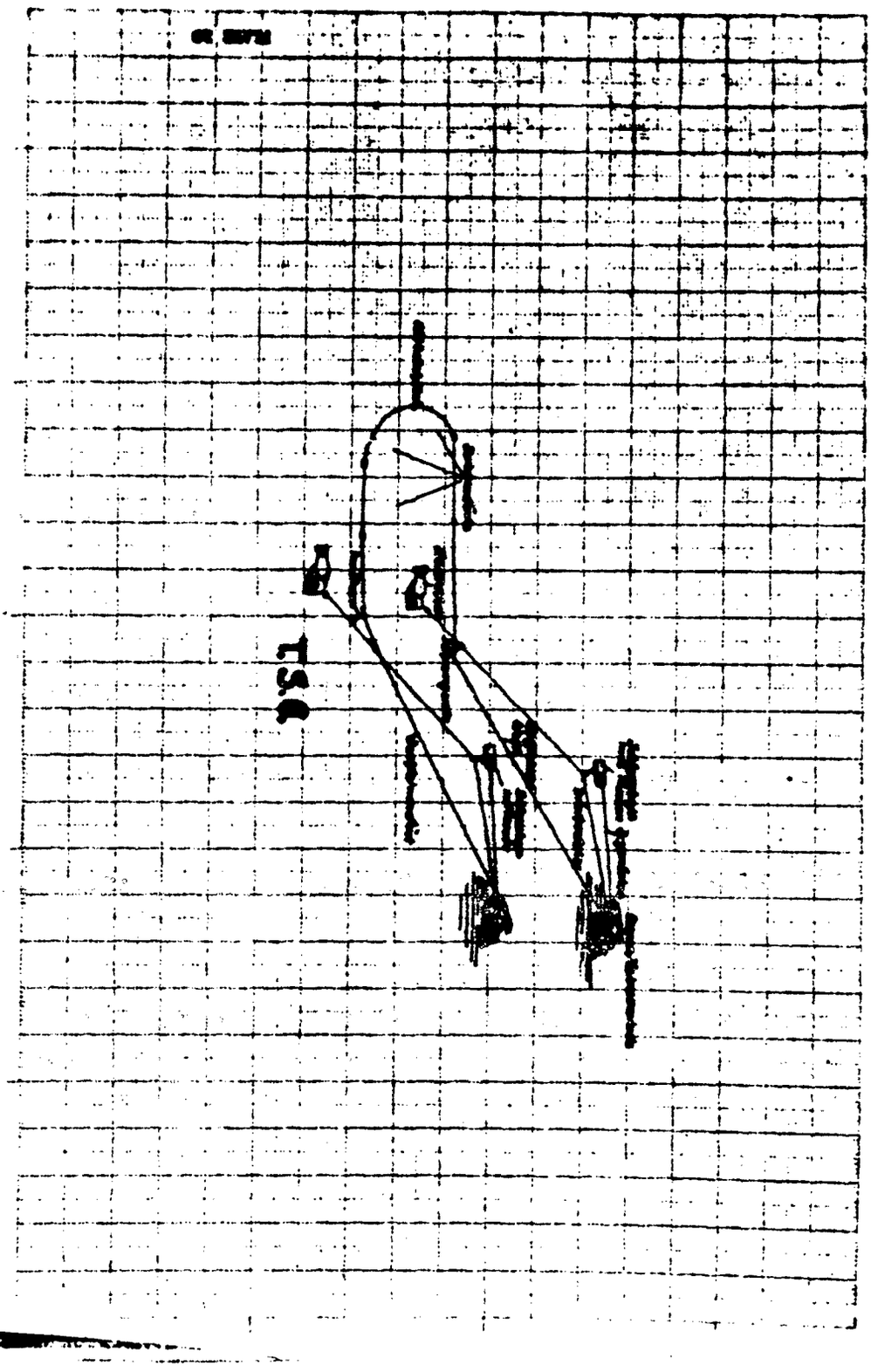


Abbildung 1

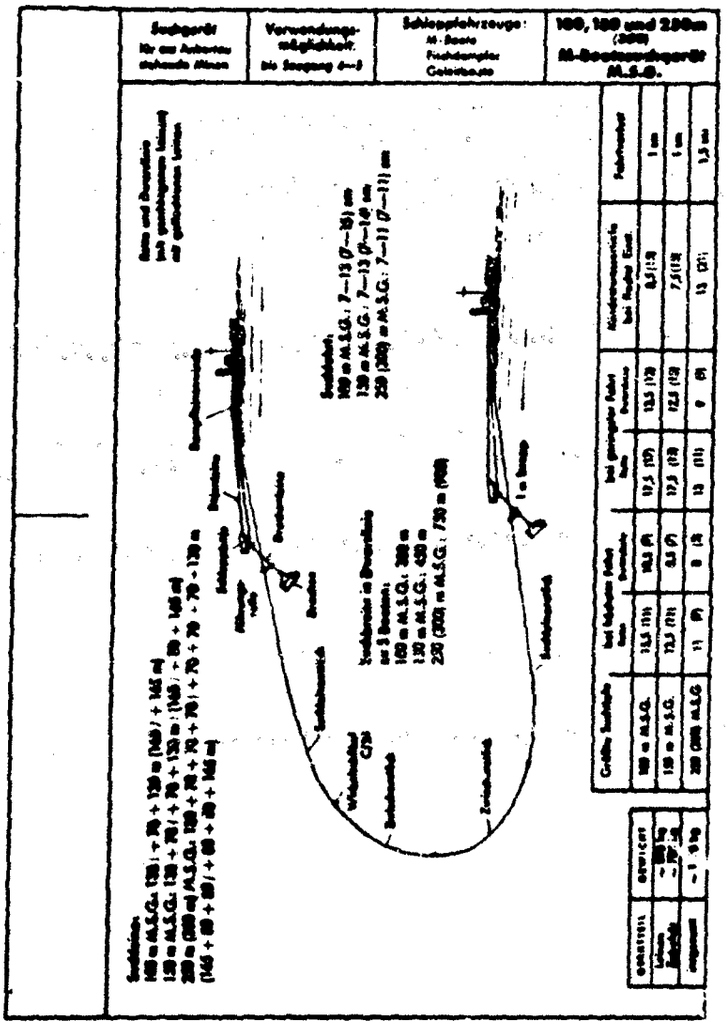


PLATE 19

M. S. u. R. G.
(mit Kl. Gr. bezw. Jgr. Gr.)