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GERMAN CHEMICAL WARFARE AND SMOKE

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SOURCE

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I. GENERAL POLICY.

Although the German government has ratified the international agreement prohibiting the use of gas as a weapon of war, it should be borne in mind that the Germans were instrumental in introducing the gas weapon into warfare. Despite the stress of active war, they independently discovered and tried out during the war 1914-1918 many of the most effective war gases known and at the same time developed an effective if sometimes faulty chemical warfare technique. Our information indicates that since the last war, German research on chemical warfare methods has been pursued unremittingly. Moreover, the German chemical industry is very highly developed. It must be assumed, therefore, that Germany is in a high state of preparedness, both offensively and defensively, for gas warfare and, if the Germans deem it expedient to introduce gas warfare, it will be pursued with their characteristic vigour, ingenuity, and ruthlessness.

The introduction of gas warfare in the form of cloud attacks from cylinders on the Western Front in the last war was, to some extent, a tactical error on the part of Germany, for the prevailing wind was inimical to such operations on over 60 percent of occasions. Modern chemical warfare methods, however, are much less dependent upon wind limitations. Consequently, it is improbable that this factor will deter them from the use of gas, and in the light of all information available, the indications are that the Germans are in a position to bring the gas weapon into effect as soon as they see fit to do so.

II. GENERAL ORGANIZATION, ADMINISTRATION AND POLICY.

General control and coordination of all German chemical warfare activities are centered in the Waffenamt (Ordnance and Supply Department, Ministry of Defense). It is presumed that this department also directs the policy regarding the offensive use of gas.

The technical side of chemical warfare is controlled by the anti-gas section in the testing branch of the Ordnance Department. Despite its nomenclature, it is probable that research regarding offensive gases is also the concern of this section, and that it cooperates in this work with the various establishments and firms enumerated in Paragraph V of these notes.

III. DEFENSE.

A. Organization, Administration, and Strength.

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Anti-gas training in the army is on a sound and efficient basis; large scale field exercises or gas war games have been reported on a number of occasions. Army anti-gas schools are located in Berlin, Celle and Braubach, and the schools attached to the firms of Auer and Draeger are also extensively used for training of instructors for the army.

It is believed that there is in each battalion or equivalent unit an anti-gas officer assisted by a non-commissioned officer, and in each company an anti-gas N.C.O. These specialists instruct their units in anti-gas measures and carry out periodical inspections of all anti-gas equipment. Each company or equivalent unit has a man detailed as a gas sentry (Gasspurer).

It is stated that in addition to these specialists, decontamination, or anti-gas detachments, exist in all formations.

B. Equipment.

1. Respirators.

a. Since 1934 the gas mask issued to the German armed forces has been of the type known as the S-Mask or Model 30/31, essentially a somewhat rigid facepiece with directly attached (screw-in) drum container, the whole transported in a cylindrical sheet metal carrier.

The facepiece is composed of canvas, rubber, and cotton fabric. The eyepieces are of cellulose acetate, with anti-dimming discs. Inlet and outlet valves are in the container attachment piece, which is screwed to take the neck of the container.

Two types of container were approved and issued for use with the above facepiece, one made by Draeger, the other by Auer (Degea). In general appearance these containers are similar, being grey-painted tinned plate drums.

The general scheme of filling for these two containers is comparable and consists of a wire gauze immediately below the neck of the drum, a finer mesh gauze made up of strands of twisted paper, a layer of brick granules, another twisted paper gauze, a layer of activated nutshell charcoal supported by a third paper gauze, and a perforated metal plate under which the particulate filter is housed. The containers differed in the volumes of the granule and charcoal layers, and in the Auer container the particulate filter consisted of ten discs of beaten cotton fibers arranged concertina fashion, whereas in the Draeger design, the

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filter consisted of a single pad of a mixture of cotton and white asbestos fibers. The granule layer is usually treated just before issue or on mobilization to protect against acid gases.

b. There is another type of respirator, the Degea 89V, which is reported to be made for use in places where heavy concentrations of gas may lie.

Of the German respirators examined since the outbreak of war, the facepieces show no material change, and some of the containers were similar to the two asbestos pad type containers already described. They bore in addition to the more usual markings, the letters "Getr" and a date, from which it may be concluded that the granules have been subjected to final treatment.

2 [In two containers, however, the filling was found to be materially different, as the normal upper layer of impregnated granules was replaced by a layer of extruded type charcoal impregnated with copper and iron, with a cotton wool pad above this layer to prevent charcoal dust being inhaled. The normal layer of nutshell charcoal was also replaced by untreated charcoal, while one of the filters contained blue asbestos instead of white. These two containers afforded protection, possibly incidental, against arseniuretted hydrogen, whereas the previous type did not.

It is probable that this is the true mobilization container. An inscription, "F.E. 37", probably meaning Feld Einsatz, or Field Container 1937, appears on the container.

The navy is stated to have an extension piece providing protection against carbon monoxide, and there are indications that a limited quantity of carbon monoxide masks and also oxygen respirators is available for land forces.

2 [It is understood that a spare container may be carried by troops on active service. As the container is merely screwed into the facepiece, it can be rapidly changed if necessary even in a gas cloud. It is improbable, therefore, that penetration will be achieved except by delivering a massive concentration on the target, and the element of surprise is essential for attack by any but persistent gas.

2. Protective Clothing. Anti-gas suits made of rubberized fabric, either in two pieces—a jacket with hood and trousers—or in one piece—the overall type with a fixed hood for

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the head—are provided for all members of decontamination squads. The material used is rubberized, either on both sides or on one side only. The former type resists liquid mustard gas for 7 hours and the latter for 2½ hours. Apart from the personnel mentioned above, these suits hitherto have been issued only for demonstration and experimental purposes on a scale of one per company or equivalent unit, but recently large issues have been made to many units.

The Germans realize that this anti-gas clothing is cumbersome and can be worn only for limited periods, but they lay much stress on training to accustom men to wearing it for long periods.

3 [Reports now suggest that German troops are provided with a sheet of rubberized fabric, called Gasplan, to protect them from splashes of blister gas (spray) and to be used as an anti-gas pathway incrossing contaminated ground. It measures about 5 feet 4 inches square. There is a hole in the center of the sheet to put the head through, and when worn, it reaches down to the knees.

3. Mobile Laundries. Mobile decontaminating plants for clothing are available in units. These are carried on powerful motor lorries and consist of a water tube boiler for generating steam quickly, a steam chamber, and a drying chamber. Uniforms can be contaminated in these vehicles in 15 minutes.

4. Decontamination Materials. Bleaching powder is the usual substance for ordinary decontamination work. Clothing will be subjected to steam treatment.

5. Anti-Gas Ointment. The Germans are reputed to prefer dry bleach to bleach ointment for personal decontamination, and their troops carry packages of Losantin tablets, a stablized bleach of high chlorine content. Mixed with water or saliva, this is used on the skin to neutralize the effects of mustard gas. Work has, however, been carried out on ointments, and it is believed that a chloramine type has been developed.

6. Gas Detectors. It is stated that German troops are issued with gas detectors in the form of sheets of test paper in an ebonite case. The chemical components of this detector are not known.

7. Collective Protection. Anti-gas curtains will probably be available for the German army, and it is stated

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that the field artillery makes a practice of gas-proofing its gun positions. Gas-proofing of tanks and armored cars has also been mentioned. It is believed that many of the fixed fortifications in Germany are equipped with filtered ventilation.

IV. OFFENSE.

A. Organization, Administration and Strength.

Germany is apparently convinced of the utility of specialist troops for conducting large scale gas operations. For several years the Germans have been experimenting secretly with different forms of offensive gas units and special smoke units, but no accurate information as to the final form of this organization is available.

1. Special Gas Units. It is believed that the Germans intend eventually to include a gas battalion in each army corps; these battalions are reported to consist of two to four mechanized companies equipped variously with portable contamination apparatus, such as wagons of 400 liters capacity for larger scale contamination, projectors, mortars, mines charged with yellow cross gas, spray apparatus adaptable to gas and smoke, and flame throwers. There are also believed to be a number of independent offensive gas companies, each about 250 strong. The latter are attached temporarily to regiments as and when required, and could, if necessary, be concentrated into larger units. It is at present uncertain whether these companies will in war be formed into the corps gas battalions mentioned above, or whether they will be retained as additional gas troops.

2. Gas in Smoke Units. The equipment of the smoke units described in Paragraph VII. A. is suitable for the dispersion of gas.

3. Gas in Tank Units. It appears certain that a proportion of the tanks in a tank regiment are fitted with apparatus for the emission of gas.

4. Gas in Engineer Battalions. There have been reports of mechanized engineer battalions equipped with offensive gas weapons, including flame throwers and gas sprayers driven by motor pumps. Such units are reported to be fully trained for offensive and defensive gas warfare; they are also reported to carry smoke apparatus for screening bridging operations.

B. Contemplated Gases for Offensive Use.

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1. General, All Types: Blister, Choking, Tear and Nose Gases.

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In the following paragraphs the main gases likely to be met are listed. Experimental work on a wide variety of other gases has been reported from time to time, and although it is not thought that any important new war gas has been discovered, indications of possible new developments are included in the lists.

Recent information suggests that the Germans are familiar with the potentialities of arseniuretted hydrogen and it has been shown that their new respirator containers afford protection against this gas.

2. Blister Gases. German Classification: "Yellow Cross".

Common Names	German Names.
a. Mustard H. S.	Lost Senfgas; Gelbkreuz.
b. Lewisite I.	Possibly Gelbkreuz II.
c. Dick (Ethyldichloro-arsine)	Dick; Grunkreuz III.
d. Vesicant Toxic Smoke (Combination of blue and yellow cross gases).	

Notes.

a. Mixtures of mustard gas and lewisite may be used in cold weather to reduce the freezing point.

b. It is not thought that Germany regards lewisite alone very favorably, but reserve stocks are reported to exist.

c. The mustard gas is likely to be an improvement on the 1914-1918 German mustard. It is more persistent, possibly more vesicant, and more difficult to decontaminate.

d. It should be noted that as a result of exposure to the fumes from some German explosives, respiratory and skin effects have been noticed. These are of such a nature that they might easily be confused with the results of exposure to blister gases.

3. Choking Gases. German Classification: "Green Cross".

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Common Names.

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German Names.

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|--------------------------------|---|
| a. Phosgene: C.G. | D. Stoff: <u>Grunkreuz.</u> |
| b. Diphosgene | K. Stoff: <u>Perstoff Grunkreuz I and II.</u> |
| c. Chloropicrin: P.S. | <u>Klop.</u> |
| d. Dick (Ethyldichloro-arsine) | <u>Dick: Grunkreuz III.</u> |
| e. Chlorine. | |

Note. There have been frequent references to mixtures of choking gases such as phosgene, diphosgene and chloropicrin.

4. Nose Gases (Toxic Smokes). German Classification: "Blue Cross."

Common Names

German Names.

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|---|------------------------------|
| a. D. A. | <u>Clark I: Blaukreuz.</u> |
| b. D. C. | <u>Clark II: Cyan Clark.</u> |
| c. D. M. | <u>D. M. Adamsite.</u> |
| d. Vesicant Toxic Smoke (Combination of blue and yellow cross gases). | |

Note. Germany shows a preference for D. A. and D. C. D. M. was not used in the war 1914-18.

5. Tear Gases. German Classification—Usually T-Stoff.

Common Names.

German Names.

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|-------------------|-----------------|
| a. C. A. P. | |
| b. B. B. C. | |
| c. Bromoacetone | <u>B-Stoff</u> |
| d. Benzyl Bromide | <u>T-Stoff.</u> |
| e. Xylol Bromide | <u>T-Stoff.</u> |

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f. Bromomethyl Ethyl Ketone (also choking gas effect).

Note. C. A. P. and B. B. C. were not used by the Germans during the last war, who make little mention of tear gases. The inference is that they attach little importance to tear gases per se, but the possible presence of lethal gases camouflaged by weak tear gas should not be overlooked.

6. Miscellaneous.

Names.	Remarks.
a. HCN (Hydrogen Cyanide)	Not used by the Germans in the last war.
b. Arseniuretted Hydrogen: Arsine (Not related to toxic smokes).	
c. Carbon Monoxide (and mettalic carbonyls)	
d. Organic Antimony Compounds	Toxic smoke in which antimony replaces the arsenic atom.
e. Camouflage or Fake Gases Used for tactical (Methyl telluride and derivatives).	purposes and economy.

C. Offensive Weapons and Equipment.

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1. General. As has already been stated, research in chemical warfare methods has been almost continuous in Germany since the last war. The marked attention given to aerial and ground methods of contamination may be taken as an indication that the Germans regard these as being more efficient and economical than artillery shell for the dispersion of gas. The possible development of some ingenious new gas weapon cannot therefore be ignored.

Since the last war the Germans have studied the influence of meteorological factors and topography on the tactical use of gas and smoke. It may be anticipated that conditions from the offensive and defensive aspects suitable and unsuitable for the use of gas have been approximately but clearly defined and an accurate estimate made of the value of the different types of weapons.

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2. Aerial Spray. Considerable work has been carried out on aerial spray. The Germans undoubtedly regard low altitude spray (below 1,000 feet) as an effective weapon both against personnel and for ground contamination, and a number of trials have been carried out in which as many as six aircraft have been employed together or in relays. They are rather significantly silent as to the possibilities of high altitude spraying; and although such evidence as is available suggests that its use is unlikely, it is not certain that the true position has been disclosed. Information as to designs of spray apparatus is meagre and of little value, as so many factors have a material influence on results. The charging will probably be mustard gas, but lewisite and mixtures of mustard gas and lewisite have also been mentioned.

3. Chemical Aircraft Bombs. Marked attention has been given by Germany to aircraft gas bombs. Types of bombs which have been mentioned are:

a. 10 kg. bombs with H. E./toxic smoke effect.

b. 50 kg. mustard gas bombs with highly sensitive impact fuse; small burster for ground contamination or larger burster for antipersonnel effect, giving an area of contamination about 20 meters radius from point of burst.

c. 250 kg. mustard gas bombs with time fuze, to function at about 100 meters above the ground and contaminate an area of about 5,000 square meters. Plain glass bombs and glass capsules, charged mustard gas.

4. Projectors. No reference has been made to any efforts to increase the range or improve the mobility of this weapon, which forms part of the equipment of the special gas units.

5. Artillery Shell. The limitations of gas shell for artillery are clearly realized. Nevertheless, reports suggest that Germany has for some time been building up extensive stocks of gas charged shell, and the evidence is rather against any development of a base ejection design of shell, but this point is by no means certain.

The Germans mainly favor the 10.5 cm. (4.14 in.) and 15.0 cm. (5.9 in.) calibers with chargings of choking gas using small bursters and blister gas using a larger burster to scatter the liquid over a considerable area. The area of contamination is given as about 50 square meters for the 10.5 cm. and 100 square meters for the larger caliber. A highly sensitive percussion fuze will be used to minimize crater formation and consequent loss

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of charging in the soil.

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Another type which they used during the last war and which they still regard as highly effective is their "Blue Cross" shell, in which a fragile container of glass filled with D. A. or D. C. is embedded in an H. E. charging. The shells have considerable H. E. effect, and the detonation is supposed to disperse the D. A. as a toxic smoke cloud. During the last war, however, our experience was that the toxic smoke effect was nearly always trifling.

6. Mortars. Mortars for the dispersal of gas and smoke are included in the equipment of the chemical troops. The 8.1 cm. (3.16 in.) mortar could, if necessary, fire a projectile containing gas, but no details are available of special designs of mortar gas projectiles.

7. Gas Grenades. Experiments have been carried out with these weapons, but no details are available. Gas grenades having twice the capacity of the last war designs are stated to be available in Germany.

8. Gas Cylinders. Although little is said about these, Germany is certainly familiar with the possibilities of the beam cylinder method of attack, and small portable cylinders have been mentioned in connection with chemical troops; also knapsack sprayers of persistent and possibly non-persistent gas.

9. Gas Mines. The Germans used a variety of designs of large caliber mortar bombs, or Minenwerfer during the last war. These could be adapted to gas chargings and might be used as contamination mines. Reference has also been made to large gas containers sunk at the sides of roads. These are actuated by a time mechanism upon passage of vehicles or fired electrically. Gas mines are also mentioned in relation to frontier fortification and on tidal beaches to harass landing parties.

10. Bulk Contamination. Tanks, armored cars, and lorries are stated to be equipped with apparatus for spraying gas and smokes. Chemical lorries are included in the equipment for the special gas units. Portable sprayers are also envisaged.

11. Toxic Generators. No evidence has been obtained that the Germans possess an official design of thermal toxic generator, but generators made by a private firm, Stoltzenberg, containing D. A., D. C., and diphenylarsinic acid have been found to be very effective, although their storage properties were not good.

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V. RESEARCH AND RESEARCH ESTABLISHMENTS.

Scientific aspects of chemical warfare are dealt with at the Technical High School at Charlottenburg. Research is also carried out at the Kaiser Wilhelm Institute in Berlin, in several state laboratories, and in the laboratories of the German Dye Combine (the I. G.), the Auer Company, and the Continental Rubber Company. A large field experimental station is situated in the Brehlo-Munster district (Lüneberger Heide), around Lake Muritz in East Prussia, and in an area near the Tyrolese border. There are probably others at Wunsdorf and List.

VI. MANUFACTURING ESTABLISHMENTS AND DEPOTS.

A. Gas.

There is little doubt that the German chemical industry could meet large demands for war chemicals. During the last war Germany manufactured nearly 50,000 tons of actual war gases, and it has been suggested that capacity is now far in excess of this.

B. Respirators.

The total number of firms at present engaged on the manufacture of either respirators or components is about twelve; of these the Auer and Draeger Companies are the most important.

VII. SMOKE.

A. Smoke Units (Nebelabteilungen).

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1. General. The Germans attach great importance to the use of smoke units, formerly a part of the artillery but now constituted as a separate arm of the service. They are controlled by the Inspectorate of Smoke Troops and Gas Defense (Inspektion der Nebeltruppen und für Gasabwehr) in the General Army Branch in the Department of the Commander-in-Chief of the Army. These units are fully mechanized. Six have been identified.

motorized?
It is possible that each corps will eventually include a smoke unit, but up to the present, so far as is known, only a few of these units have been formed. They could, if necessary, be used as gas troops, as the weapon with which they are equipped could be employed to fire a gas projectile.

2. Organization. Each smoke unit consists of headquarters, signal section, and three smoke companies each of two

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5 sections, each provided with four mortars. One company is equipped with material for decontaminating gassed areas.

3. Strength. Little information is available. It is believed that the strength of a smoke company is about 120 all ranks, and that it has approximately 24 vehicles (four cars for commanders, twelve lorries for personnel and eight lorries for weapons and equipment).

4. Armament. Each smoke unit has 24 and each company eight 8.1 cm. (3.16 in.) mortars. It is possible that a 10 cm. (3.93 in.) mortar may be introduced.

B. Equipment.

Information is lacking as to actual smoke materials used, but it is reasonably certain that the Germans possess:

1. Generators or smoke pots, probably with Berger type mixtures.
2. Generators of the C. S. A.-lime type.
3. Spray-type smoke apparatus probably using C. S. A. or oilum.

Preference seems to be given to spray apparatus of the C. S. A. type for land forces. The C. S. A.-lime generator was developed during the last war.

C. Smoke Units and Apparatus in Other Arms of the Service.

1. Artillery. It is believed that the Germans consider the dispersion of smoke by artillery weapons uneconomical, as the latter are thereby prevented from carrying out their primary function. Smoke shell is, however, still carried in artillery units.

2. Tank Units. It is believed that a proportion of the tanks in each tank regiment and other armored vehicles are provided with smoke-producing apparatus.

3. Engineer Units. It is probable that engineer units are or will be equipped with smoke-producing apparatus to cover working parties engaged in bridging and similar operations and can use it for screening special sites such as railheads.

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4. Aircraft. It is reasonably certain the Germans possess smoke curtain apparatus for use by aircraft using titanium tetrachloride. German aircraft also lay smoke screens, as distinct from vertical curtains, in conjunction with land forces.

D. Other Special Smoke Units (Einnebelungsabteilungen).

Special smoke units exist, but their organization is not known. It is probable that they come under the Air Ministry and form part of the air defense organization of the country. They are, it is believed, responsible for protection of stations, bridges, industrial areas, etc., against air attack, and for such protection they use smoke screens. They are said to be equipped with small generators and large smoke spray apparatus.

VIII. INCENDIARY.

1. Bombs. The Germans have a very high opinion of the offensive value of incendiary bombs, particularly as a means of attack on rear areas and civilian centers. The bombs principally considered are of the electron type, containing a thermite charging in a casing of metallic magnesium, of 2, 5 and 10 kilos., and would be released from aircraft in large numbers against suitable targets. There is a tendency in foreign practice to insert a small explosive charge in the larger type of incendiary bombs to prevent interference with them during the burning period.

2. Flame Throwers. Little is known regarding types of flame throwers in use, and it is possible that no definite decision regarding these weapons has yet been reached.

The Germans developed and used during the last war two types:

a. A portable type carried on the soldier's back. This was capable of projecting a jet of flame about 20 yards for a period of about one minute.

b. A cumbersome semi-stationary type consisting of several cylindrical tanks of oil, which could be used in relays together with suitable cylinders of compressed nitrogen to provide the pressure, and connecting pipe systems, the whole weighing several tons and capable of projecting a jet of flame about 40 to 50 yards.

Germany has continued to experiment with these weapons and it is stated that she possesses both portable and semi-stationary types comparable with the above, with somewhat increased

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range.

In addition, a larger type mounted on tanks or armored vehicles, or mounted permanently in concrete emplacements has been developed as an antitank weapon. The mobile types must, however, be highly vulnerable, because of the large quantity of inflammable oil they carry. The range is given variously as 45 to 120 meters, but this is probably an exaggeration.

The latest information is of 2-ton flame thrower wagons, each carrying a heavy machine gun and a flame thrower coupled to the engine of the vehicle, with a range of about 200 yards.

IX. BACTERIA.

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Methods of bacteriological warfare have been thoroughly investigated by scientific experts and courses on this subject are held from time to time in Berlin. The students at these courses, which, it is believed, last for six weeks, are advanced gas specialists.

Experiments on the spraying of "foot and mouth" disease, dispersal of anthrax spore, pollution of water supplies and destruction of crops by means of germs dropped from the air, have been specifically mentioned. Some of these are directed by the Agricultural High School at Bonn.

It is maintained that the whole investigation is being undertaken from the defensive point of view, as Germany is in possession of authoritative information that preparations for bacteriological warfare are at present being made in Russia.

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