The Use of Poison Gas in World War I and the Effect on Society
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Probably the most feared weapon used in World War I, poison gas, had a major effect of the soldiers who participated and had a lasting effect on society. The use of poison gas opened a new front in World War I. For the first time, a weapon did not involve a gun or soldier-to-soldier contact. Poison gas also opened a new moral front. It was not a direct attack, and some argued that it caused unneeded deaths, and unneeded injuries. The effectiveness of gas as a weapon had a crushing effect on morale, especially on those who had to live with the dying. The burnt skin, the blindness and the vomiting were constraint reminders of the new weapon. The use of poison gas deeply effected society and was condemned by the general opinion of the civilized world.

When war erupted in August, 1914, everyone from private citizens to the leaders of the belligerent countries shared a common belief that the economies of the European nations would neither survive nor support a lengthy war. As a result, the war plans of two key protagonists, Germany and France, called for a quick, decisive offensive against one another. Kaiser Wilhelm II of Germany assured his troops that they would be home before the leaves fall. It was not to be. By the end of 1914, the armies on the Western Front were locked in a deadly form of trench warfare sustained by the very industrialized economies that, because of their complexity and interdependency, had been thought unable to withstand a long war.

Unwilling to accept the indecisiveness of trench warfare, army staffs on both sides' pondered ways to break the deadlock and return to open or maneuver warfare. Alternatives were proposed, some strategic, others tactical. The British, for example, sought a strategic solution by a seaborne assault against Turkey, an ally of Germany. This attack at Gallipoli in 1915 sought to open the Dardanelles as the first step toward linking up with Russia and forcing Turkey out of the war. For a variety of reasons, the plan failed, and the deadlock on the Western Front continued. Germany also searched for ways to break the deadlock and decided on a solution involving gas.

Early in the war the Germans kept a wary eye out for indications that the French were using gas grenades. In August, 1914, France did use this chemical weapon, but in open areas where the gas quickly dispersed with no noticeable effect on the enemy. The French soon discarded the grenades as worthless. At this same time, stories were appearing in Allied newspapers about a new French liquid explosive, turpentine. While claiming that this substance gave off lethal fumes, the articles failed to explain that the gas reached a deadly concentration only in confined spaces. Still, the Germans were apprehensive and became alarmed by the deaths of a number of soldiers asphyxiated during a French bombardment, even though a medical team rushed to the scene concluded that the men died not from poison gas, but from inhaling carbon monoxide fumes while huddled in their dugout. In any event such newspaper stories and front-line experiences may have spurred the development of poison gases by German scientists. Contributing to that effort, chemistry professor Walter Nernst suggested partially replacing the TNT in a 105mm shrapnel shell with dianisidine chlorosulphonate, an agent known to cause irritation of the mucous membrane. The new filling would serve two purposes. It would conserve TNT and act as a chemical weapon. The German High Command accepted this new weapon, although it is uncertain which of the two purposes it initially considered more important. On 27 October 1914, 3,000 of these shells fell on British troops near Neuve-Chapelle. The soldiers suffered no ill effects and never suspected they were under chemical attack. The Germans continued to experiment with gas because they were convinced the idea had merit and because intelligence sources could not determine what effect the shells had had at Neuve-Chapelle.

The German General Staff asked the Kaiser Wilhelm Institute for Physical Chemistry and Electrochemistry in Berlin to investigate the possibility of using a more effective agent. The only guideline provided by the military was that The Hague declaration of 1899, banning projectiles used exclusively for delivering poison gases had to be circumvented. Adhering to the letter if not the spirit of the ban, the Germans devised a gas shell that also contained an explosive charge for producing a shrapnel effect. The Professor von Tappan who designed the shell also solved two technical problems related to emplacing chemicals in an artillery projectile. First, he stabilized the liquid within a shell casing in order to reduce its tumbling in flight, thereby increasing the shell's accuracy and range. Second, to ensure that two extremely reactive chemical substances did not accidentally combine in the shell casing, von Tappan developed a special shell, designated the T-shell by the German Army in his honor. The T-shell was a standard 15cm howitzer round that contained seven pounds of xylyl bromide and a burster charge for a splinter effect. A lead lining prevented contact between the burster charge and the chemical payload.

The German High Command decided to use the first T-shells on the Eastern Front. On 31 January 1915, over 18,000 shells were fired at Russian positions at Bolimov. German officers, confident that their new weapon would neutralize the enemy positions, were surprised when their attack was repulsed with severe casualties. The shelling had had little or no effect on the Russians because cold temperatures had prevented vaporization of the xylyl bromide. To find a more effective means of employing gas on the battlefield, the German High Command turned to an assistant of von Tappan, Professor Fritz Haber. Haber, a reservist, had shown marked enthusiasm for the potential value of chemicals as weapons. Believing that T-shells did not provide a high enough concentration of chemicals to produce enemy casualties, he suggested the use of large commercial gas cylinders as a delivery system. Cylinders could deliver large amounts of gas and, like the T-shell, did not technically violate The Hague ban on projectiles. Haber also recommended the use of chlorine as an agent because it was commercially produced and readily available in large quantities. Chlorine also satisfied the requirements for military application. It was lethal, immediately effective, non-persistent, and volatile. It was also dense enough to resist dilution in a moderate wind.

Haber's gas cylinder project received the approval of the Chief of the German General Staff, General Erich von Falkenhayn, who had the professor appointed Head of the Chemical Warfare Department in the Prussian Ministry of War. The high command selected the front of the Fourth Army facing the French salient at Ypres as the location for an experimental attack. Pioneer Regiment 35 was designated to conduct the gas attack. Haber, assigned as a chemical-technical advisor, assisted Colonel Peterson, the regimental commander, and instructed the troops on the emplacement and use of gas cylinders. By 10 March 1915 the Regiment, with the assistance of infantry labor, had emplaced 1,600 large and 4,130 small cylinders containing a total of 168 tons of chlorine. Then, for one month, the Pioneer troops sat and waited for the winds to shift westerly toward the enemy trenches in the Ypres salient. Only then could they safely unleash the chemicals by opening the cylinder valves. Late in the afternoon of 22 April 1915, the wind was favorable and the gas was released over the battle-scarred terrain around the medieval Belgium city of Ypres. Soon, thousands of French soldiers were streaming to the rear, clutching their throats, coughing, stumbling and turning blue in the face. Within the hour, the front line had been abandoned and a gap 8,000 yards wide had been opened in the Ypres defenses. Some of the gas drifted into the Canadian positions but their line was held and reinforcements found to stem the advance of the German infantry.

The success of the new weapon was as big a surprise to the Germans as the weapon itself was to the French. The Germans regarded it as a mere experiment and although protective

breathing devices had been developed years before for industrial purposes, none had been provided to the attacking troops. The advancing Germans were shocked by what they found. Five thousand enemy soldiers lay on their backs, struggling for breath, suffocating in agony and terror. The Germans became so afraid of catching up with the gas as it rolled on before them that they advanced only two miles and stopped.

By the standards of an attack with limited objectives, the gas cloud attack at Ypres was a resounding success. The villages of Pilckem and Langemarck were in German hands and two thousand Frenchmen and 51 guns were captured. Subsequent gas cloud attacks at Ypres and at other places on the western front did not have the dramatic effect of the first gas attack against Pilckem Ridge. News of the new weapon quickly spread to other parts of the front. Field expedient gas masks were speedily designed, manufactured, and issued. Although they were far from effective in keeping those in a gas cloud from eventually succumbing, their use reduced the short-term ability of gas to cause wholesale causalities and panic.

The inability of all but the first German gas cloud attacks to clear an enemy position severely limited their tactical utility. German infantry following a gas cloud into the attack would either have to follow at a considerable distance, thus allowing the enemy a few vital seconds in which to recover his composure, or attack close behind the cloud, making it necessary for them to wear gas masks of their own. Never comfortable, the gas masks of World War I were incapable of letting in sufficient amounts of breathable air to allow the wearer to scramble over “no man’s land” at anything like an acceptable pace for an attack. Another limitation of gas cloud attacks was inherent in the technical means then available. The gas cylinders were heavy and bulky. Moving them to and installing them near, the front line trenches was difficult, dangerous, and time-consuming work. Worse still from a tactical point of view, such activity was hard to hide from the watchful eyes of the enemy just a few score meters away. As a result, surprise was impossible to achieve. Gas clouds were also limited by the weather. Some gas clouds failed because of the lack of a favorable wind or a sudden shift in the wind. Although German chemists made valiant attempts to improve the effectiveness of the gas cloud attacks, the limitations on the tactical use of such weapons remained. After Ypres, the German scientists working on gas warfare concentrated on finding ways of delivering gas by artillery and trench mortar shells. These would not have any significant impact on tactics until 1917.

Realizing the inherent limitations of gas attacks, the German War Ministry had ordered the concurrent development of artillery and trench mortar shells capable of delivering various types of gas. These were of little tactical value, however, until German chemists developed gases that were deadly in small quantities, so that the few cubic centimeters of gas carried within a projectile would have the desired effect on the enemy. The first gases to meet this requirement were “K-Stoff,” a chemical that asphyxiated those affected far more effectively than chlorine, and “T-Stoff,” a strong but non-poisonous irritant. The chief tactical uses of these gas shells in trench raids and attacks with limited objectives were counter-battery fire and the building of “box barrages” to isolate positions.

By 1917, German artillery pieces and trench mortars were regularly firing three types of poison gas shells. Those shells know as “Yellow Cross” contained mustard gas, a heavy, oily substance that would cause painful boils on the skin and temporary blindness a few hours after contact. The slowness with which mustard gas acted, as well as the fact that it took days to dissipate, dictated the way in which it could be used on the battlefield. Mustard gas was employed primarily to attack forces on the flanks of an area being attacked, so as to reduce their ability to participate in a counterattack. It was not used against the position

that was to be attacked itself, as that would expose the attacking troops to the effects of the gas.

Green Cross shells carried diphosgene, an especially effective asphyxiating agent that was to serve as the primary killing gas of the last two years of the war. By the time that diphosgene was introduced, however, gas masks had been sufficiently improved so as to be proof against it. To solve this problem, the Germans used Green Cross shells in combination with Blue Cross shells containing both high explosive, about 75%, and diphenylchlorarsine, about 25%, a chemical that could penetrate all but the best gas masks. Although the gas was deadly only in very high concentrations, it cooperated with diphosgene by causing the victim to sneeze violently. This sneezing forced the victim to tear off his gas mask t, thus exposing himself to the deadly effect of the diphosgene. The combination of the Green Cross and Blue Cross shells was used in trench raids and attacks with limited objectives to attack enemy artillery positions as well as to build box barrages.

The British and, French also developed gas shells with unique color codes. The French Army used these shells almost as extensively as the Germans and fired the first phosgene-filled artillery shells on 22 February 1916 at Verdun. The French also experimented with an extremely small bursting charge in order to increase the gas payload. This French innovation allowed a stable, dense cloud to form. Although the French increased the chemical payload, they erred by adding comparatively harmless smoke producers, such as stannic chloride, thus reducing the toxic capacity of their phosgene shells by 30 to 40 percent.

The major combatants realized that the employment of gas called for specially trained troops and, accordingly, formed offensive gas units. Because of the need to emplace gas cylinders, pioneer or engineer troops usually provided the cadre of these special units. The Germans converted two pioneer regiments, the 35th and 36th, into gas units consisting of three battalions each. The regiments would deploy by companies, according to the size of the front of the attack. In addition to these units, the Germans organized a gas mortar battalion. The Austro-Hungarians followed the German model and created their own special gas units. As early as July, 1915, the French and British organized gas companies called "Special" by the British and "Z" for by the French both employed engineer troops as cadre. By 1917 the British had expanded their original four companies to twenty-one and had organized them as a Special Brigade. The French eventually created the 31st, 32nd, and 33rd gas battalions composed of three companies each. The Russians organized gas units and called them Gas Detachments of the Chemical Department, with one detachment assigned to each Russian Army, a total of thirteen.

During January through March of 1918 there were many raid carried out by the German forces in the west. Artillery not only participated in these operations but also participated in the dumping of mustard gas on French and British positions that were not scheduled to be overrun by the attacking armies. The gassing, with Yellow Cross shells, of the British, French and Belgian positions all along the western front began on 9 March and lasted until the nineteenth. This operation not only resulted in tens of thousands of enemy casualties but also aided in the effort to keep Germany's enemies from discovering the exact time and place of the long-awaited offensive. Mustard gas, while accounting for few deaths, was very effective in occupying every available minute of the troops who were unfortunate enough to be in its vicinity. Those who did not become casualties were so preoccupied with the business of decontamination of themselves, their equipment, and their surroundings that any though of a trench raid or even of a patrol into no man's land was out of the question. Mustard gas was caustic, and had its worst effect on moist areas of the body. The effects to the skin would be blistering that would be worst the longer the exposure. Blistering would

start several hours or several days later. The mildest reaction would be reddening and itching, but the worst ones would be large blisters that became gangrenous, again the greater the exposure the greater the reaction.

The eye's were the most likely to be damaged, we have all seen the pictures of trails of men with padded eyes walking in lines with hands on the shoulders. After exposure the first symptoms would be two hours later with an irritation to the eyes, like some foreign body in them. Then the eye lids would swell forcing the eyes to close, the conjunctiva in the eyes swell. The eyelid would burn and get cramp. The eyes would be very sensitive to light. The vision would then be lost as the cornea became ulcerated and decays. The effect on the eye's was gross, but non fatal, the effects on the respiratory tract were worst and life threatening. If the victim had a small exposure they would get the first symptoms three hours after exposure, the throat would have an irritation and an urge to cough would result, there would be a difficulty in swallowing and shortness in breath. The inner passages of the respiratory tract would then become inflamed. The gums would develop dead tissue and the throat would become congested. If the victim inhaled large amounts of gas the above would happen, plus the lungs would die in parts. Bronchitis would follow with a tightening of the throat. Pneumonia would follow with bleeding and dead tissue collecting, the inner passages would secrete mucous and these could block the airway. The outcome would be that the airways would eventually block and the victim suffocates. There were two peaks of death occurring, day three and day eight. Other organs could also be damaged like the alimentary system, causing sickness, diarrhea and bowel damage- disabling not killing. All of the above non fatal damage left men open to diseases such as Tuberculosis and Pneumonia as the bodied defense system often became suppressed, that and the damage already inflicted usually lead to the victim being overwhelmed. In the American Army out of the nearly 58,000 gas casualties, 26,828 were known to have due to mustard gas. Its smell belied its effect. One American ‘doughboy’ likened it to a rich bon-bon filled with perfumed soap. Chlorine gas, on the other hand, was rather like a mixture of pineapple and pepper, whereas phosgene had more the stench of a barrel of rotten fish. Each type of gas had its own ghastly effects. The chlorine gases led to a slow death by asphyxiation, end even the hopeless cases often took days to die, remaining conscious to within five minutes of the end.

With mustard gas, the effects did not become apparent for up to twelve hours. Then it began to rot the body, within and without. The skin blistered, the eyes became extremely painful and nausea and vomiting began. Worse, the gas attacked the bronchial tubes, stripping off the mucous membrane. The pain was almost beyond endurance and most cases had to be strapped to their beds. Death took up to four or five weeks. Some sort of precaution was available almost immediately after the first gas attack. One division sent a sanitary officer to Paris to commandeer all the ladies’ veiling he could find. The first anti-gas drill consisted of men running around in circles, holding noses and grasping between their teeth cloth soaked in hyposulphite and wrapped in ladies’ veils. Within sixty hours 98,000 pads of cotton waste in muslin containers were available at the front, two million having been provided at the end of the first month. Another early expedient was to clasp pads soaked in urine to one’s nose and mouth. Unpleasant an experience as this was thee ammonia in the urine did help to neutralize the chlorine. Later in the year a large block gauze pad was used. Tied with tapes it had an extra flap to cover the eyes. Troops were provided with a bottle of hyposulphite solution in which to soak the pad. The next expedient was a grey flannel hood with mica eye-pieces, impregnated with phenol. After these there followed two types of tube-helmet, so called, which were the same as the hood with the addition of a rubber-tipped metal tube, to be held between the teeth for exhalation, and better fitting eye-pieces. From late 1917, the famous box respirator replaced all these

devices and was soon standard issue for troops at the front. All in all, some twenty-seven million gas-masks of various types were manufactured in Britain during the war.

One on the few Americans who directly experienced trench warfare and poison gas, William L. Langer described his experience in his book *Gas and Flame in World War I.* "How shall I adequately describe our experiences during those five horrible hours, as we lay in shell holes or on the road—those dreadful, endless hours of paralyzing uncertainty and suspense, during which machine guns united with shellfire and gas to make death seem ever so much closer than life? For a time it seemed likely that the enemy's infantry would attack before our own, and so we lay there, huddled together, nerves tense, weapons ready, determined, if the occasion should arrive, to sell our lives as dearly as possible, for I hardly believe there was one of us who expected to get away alive."

Contamination of food, water, tobacco, and equipment by chemical agents emerged as a significant problem for the troops. On an interim basis the Gas Service issued tar paper and oil cloth to cover food and tobacco. Water contamination was always a problem, because the scarcity of water often compelled men like a 79th Division doughboy at Montfaucon to risk drinking from a suspicious source. Driven by thirst, this American ignored the warning of French soldiers and drank stagnant water from a shell hole. He later suffered chest pains from the gas contaminated water. After being evacuated he eventually returned to his unit, but only after twenty-three days in a base hospital. Late in the war, the Quartermaster Corps packaged foodstuffs destined for France in gas-proof, airtight trench ration containers.

As for equipment, the corrosive properties of most gases created problems of contaminated artillery shells not being able to be chambered, breechblocks jamming, gun surfaces rusting, and contaminated small arms cartridges not chambering properly. American Expeditionary Force regulations required weapons and shells be cleaned with oil immediately after a gas attack, but the metal continued to corrode unless small arms were disassembled and boiled in a solution of sodium bicarbonate and water. The difficulty of applying decontamination method in the trenches, not to mention in no man's land during a prolonged assault lasting several days, can be well imagined, Protection of animals was also a problem, and they, too, were fitted with protective masks.

When doughboys came out of their trenches, they, their commanders, and their gas officers alike faced increased challenges and many difficulties not met with in trench warfare. At times, good gas discipline had little or no impact on casualties in the maelstrom of battle. The reports of gas officers constantly referred to gas casualties caused by men being knocked down, or shocked and stunned by German high explosive shell fire. The concussion of the exploding shells slowed the men's reaction or worse, knocked them unconscious, and they never had a chance to put their mask on. Many times the blast tore off a mask or flying shrapnel cut the face piece or damaged the hose from the filter to the mouthpiece. The extensive use of gas both at day and night often meant prolonged use of the mask. Lt. Robert A. Hall, for example, blamed a significant number of the 1st Division's gas casualties at Villers-Toumelle on the fact that after seventeen to eighteen hours of good gas discipline wearing the gas mask, perspiration consequence, became gas casualties.

Troops caught in the open by enemy gunners often sought cover in shell holes, ravines, and patches of wood, the very places where gas lingered the longest. Even if men maintained strict gas discipline, casualties were inevitable when the enemy concentration of gas shells became too dense. Typical engagements were gas was used are exemplified by that of the American 29th Division. From 0600, 12 October to 1600, 13 October 1918, the 114th Infantry, 29th Division, attacked German positions at Bois Ormout. The Germans fired an

estimated 2,000 gas shells at the regiment in bursts of about 300. Yellow, Green, and Blue Cross 77mm and 105mm shells landed around the 1,500 men of the 114th Infantry while they deployed in ravines, shell holes, and wooded areas. As a consequence, 500 men became gas casualties, mostly with lung injuries. The commander requested permission to evacuate the contaminated area. The French 66th Regiment commander, who had operational control of the attack, told him to remain in place. The Frenchman believed the withdrawal of the regiment was not tactically sound, for the Germans would counterattack if they detected any sign of an Allied retreat. Maj. James H. Walton, the division gas officer, remarked that this incident, in which high gas casualties were inflicted despite good gas discipline, was one of the "best examples of the deadly effects of gas shell" he had seen in combat.

On 6 February 1918, the International Committee of the Red Cross (ICRC) made a forceful public appeal against the use of poison gas to the belligerents of World War I. The ICRC described this gas as a "barbarous invention which science is bringing to perfection", protesting "with all the force at our command against such warfare which can only be called criminal" and warning of "a struggle which will exceed in barbarity anything which history has known so far". The estimated fatal gas casualties during World War I is 85,000 and the non-fatal gas casualties is 1,176,500. Many of those who survived a gas attack were scarred for life. Respiratory disease and failing eye sight were common post-war afflictions. Many of those who were fairly soon recorded as fit for service were left with scar tissue in their lungs. This tissue was susceptible to tuberculosis attack. It was from this that many of the 1918 casualties died, around the time of the Second World War, shortly before the sulfa drugs became widely available for its treatment.

Unexploded WWI ammunition, including chemical ammunition, was a major problem in former battle areas after the end of the War, and has ever since been present. Shells may be, for instance, uncovered when farmers plough their fields; more importantly, shells are regularly discovered when public works or construction work is done. While classical shells pose a risk of explosion, their disposal is relatively easy. It is not the case with chemical shells. An additional difficulty is the current severity of environmental legislation. In the past, a common method of getting rid of unexploded chemical ammunition was to detonate or dump it at sea. This is now prohibited in most countries. The problems are especially acute in some Northern regions of France. The French government no longer disposes of chemical weapons at sea. For this reason, piles of untreated chemical weapons accumulated. In 2001, it became evident that the pile stored at a depot in Vimy was unsafe; the inhabitants of the neighboring town were evacuated, and the pile moved, using refrigerated trucks and under heavy guard, to a military camp in Suippes. In Belgium, a similar plant was planned in 1993 and brought in service in 1999, two years late, indicating the difficulties in disposal of such wastes. Germany, too, has to deal with unexploded ammunition and polluted lands resulting from the explosion of an ammunition train in 1919.

By the end of the war, public opinion had by then turned against the use of such weapons, which led to the Geneva Protocol, a treaty banning the use, but not the stockpiling, of lethal gas and bacteriological weapons which was signed by most First World War combatants in 1925. The signatory nations agreed not to use poison gas in the future, stating "the use in war of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world." Nevertheless, precautions were taken in World War II. In both Axis and Allied nations, children in school were taught to wear gas masks in case of gas attack. Italy did use poison gas against Ethiopia in 1935 and 1936, and Empire of Japan used gas against China in 1941. Germany developed the poison gases Tabun, Sarin, and Soman during the war, and, infamously, used Zyklon B in Nazi extermination camps. Neither Germany nor the Allied

nations used any of their war gases in combat, possibly heeding warnings of awful retaliation.

Chemical weapons had lost much of their effectiveness against well trained and equipped troops. During World War I, one quarter of artillery shells fired contained chemical weapons but caused only 3% of the casualties. Nevertheless, in the following years, chemical weapons were used in several, mainly colonial, wars where one side had an advantage in equipment over the other. The British used adamsite against Russian revolutionary troops in 1919 and mustard against Iraqi insurgents in the 1920s; Spain used chemical weapons in Morocco against Rif tribesmen throughout the 1920s and Italy used mustard gas in Libya in 1930 and again during its invasion of Ethiopia in 1936. In 1925, a Chinese warlord, Zhang Zuolin, contracted a German company to build him a mustard gas plant in Shengyang, which was completed in 1927.

Although all major combatants stockpiled chemical weapons during the Second World War, the only reports of its use in the conflict were the Japanese use of relatively small amounts of mustard gas and lewisite in China, and very rare occurrences in Europe. For example, some sulfur mustard bombs were dropped on Warsaw on 3 September 1939, which Germany acknowledged in 1942, but indicated that it had been accidental. Mustard gas was the agent of choice, with the British stockpiling 40,719 tons, the Russians 77,400 tons, the Americans over 87,000 tons and the Germans 27,597 tons. The mustard gas with which the British hoped to repel an invasion of the United Kingdom in 1940 was never needed, and a fear that the allies also had nerve agents prevented their deployment by Germany.

While poison gas technology played an important role in the Holocaust, one notable poison gas casualty of World War I was Adolf Hitler, who was temporarily blinded. He refused to employ poison gas weapons in World War II. Although chemical weapons have been used in at least a dozen wars since the end of the First World War, they have never been used again in combat on such a large scale. The use of mustard gas and the more deadly nerve agents by Iraq during the 8-year Iran-Iraq war killed around 20,000 Iranian troops (and injured another 80,000), around a quarter of the number of deaths caused by chemical weapons during the First World War.

General John J. Pershing, in his *Final Report*, made specific reference to three weapons introduced in World War I and the impact each had on the conduct of the war. The three weapons Pershing listed were the tank, aircraft, and poison gas. Only one, gas, caused him to reflect on its use in any future war. He declared, "Whether or not gas will be employed in future wars is a matter of conjecture, but the effect is so deadly to the unprepared that we can never afford to neglect the question." Pershing, with the experience of the war behind him, pointed out that gas was a significant weapon, but not as a producer of battle deaths. When, looking at the total figures, 27.3 percent of all American casualties, dead and wounded, were caused by gas. With respect to the burden gas casualties placed on medical facilities, not to mention the replacement system, a significant 31.4 percent of all American wounded were treated in hospitals for gas wounds. Gas in World War I did not have to cause large numbers of casualties to be an effective and versatile weapon. Gas warfare placed additional strain on every aspect of combat. According to British Maj. Gen. Charles H. Foulkes, Commander of the Special Brigade, “the appearance of gas on the battlefield changed the whole character of warfare." In World War I, gas was everywhere, in clothing, food, and water. It corroded human skin, internal organs, and even steel weapons. The smell of gas hung in the air, and the chemical environment became a reality of everyday life. Not only did men have to train constantly, but an entire logistical network had to be established for offensive and defensive gas equipment. A new branch of the U.S. Army came into existence, and new units, such as decontamination squads, mobile degassing

units, and special gas troops, were created. These organizations, in turn, took manpower away from the combat arms, as combat arms officers became gas officers in divisions, regiments, and battalions. Also, the impact of gas on the Medical Department posed tremendous problems in the treatment of casualties. The number of gas wounded became so great that one field hospital out of four per division was dedicated to the treatment of gas victims.

Despite the pervasive impact of chemical agents on the battlefield, commanders and staffs had difficulty adjusting their thinking and planning in such a way as to make effective use of these new weapons that were totally different from anything they had ever been trained to use. Not only did commanders and staffs have difficulty determining how they would employ the new weapon to their tactical advantage, but they also had to consider the effects of enemy gas on their own troops. By entering the conflict without preparation for chemical warfare, commanders never fully comprehended the potential of gas on the battlefield.

The experiences of the war led to a sort of collective national trauma afterwards for all the participating countries. The optimism of the 1900s was entirely gone, and those who fought in the war became what were known as “the Lost Generation” because they never fully recovered from their experiences. For the next few years, much of Europe began its mourning. Memorials were erected in thousands of villages and towns. The soldiers returning home from World War I suffered greatly, since the horrors witnessed in that war had never before been seen in history. Although it was then commonly called *shell shock*, it is now known that many returning soldiers suffered from Post Traumatic Stress Disorder. The soldier’s experience with gas contributed to their horrors.

This social trauma manifested itself in many different ways. Some people were revolted by nationalism and what it had supposedly caused and began to work toward a more internationalist world, supporting organizations such as the League of Nations. Pacifism became increasingly popular. Others had the opposite reaction, feeling that only strength and military-might could be relied upon for protection in a chaotic and inhumane world that did not respect hypothetical notions of civilization. “Anti-modernist” views were a reaction against the many changes taking place within society. The rise of Nazism and fascism included a revival of the nationalistic spirit of the pre-war years and, on principle, a rejection of many post-war changes. A sense of disillusionment and cynicism became pronounced, with nihilism growing in popularity. The horrors of poison gas certainly contributed to a disillusionment towards humanity.

Many people believed that the war heralded the end of the world as they had known it, including the collapse of capitalism and imperialism. Communist and socialist movements around the world drew strength from this theory and enjoyed a level of popularity they had never known before. In the military, these feelings were most pronounced in areas of tactical thinking. The result was a complete inversion of the defensive tactics favored by military thinkers for the previous half century. Gas weapons destroyed the tactical advantage of the defender and would eventually force infantry combat out of the claustrophobic trenches made necessary by the high rate of fire brought about by the repeating rifle.

Military thinkers entered the First World War with the assumption that the weapons and tactics of the era favored the attacker. Machine guns, heavy artillery, and the breach loading rifle would all bring about a fast moving war in which the first blow was decisive. These tactics would prove false as Europe rapidly degenerated into a hellish nightmare of blood, mud, gas, and death. With miles of trenches supplied by supporting trenches and auxiliary trenches, machine guns, artillery and poison gas use proved most effective at

cutting down futile offensives and shattering the minds of a generation of young men. Poison gas proved an effective and brutal weapon in the stalemate with results so devastating that it remains a banned weapon to this day.

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