

**U.S. ARMY
CHEMICAL
CORPS**
Museum

ARMY CHEMICAL CENTER, MARYLAND

U. S. ARMY CHEMICAL CORPS MUSEUM

The U.S. Army Chemical Corps Museum houses the most comprehensive collection of United States and foreign chemical warfare materiel known, and is operated under supervision of the Director, Exhibit-Museum Unit, Headquarters, U.S. Army Chemical Corps Engineering Command, Army Chemical Center, Maryland.

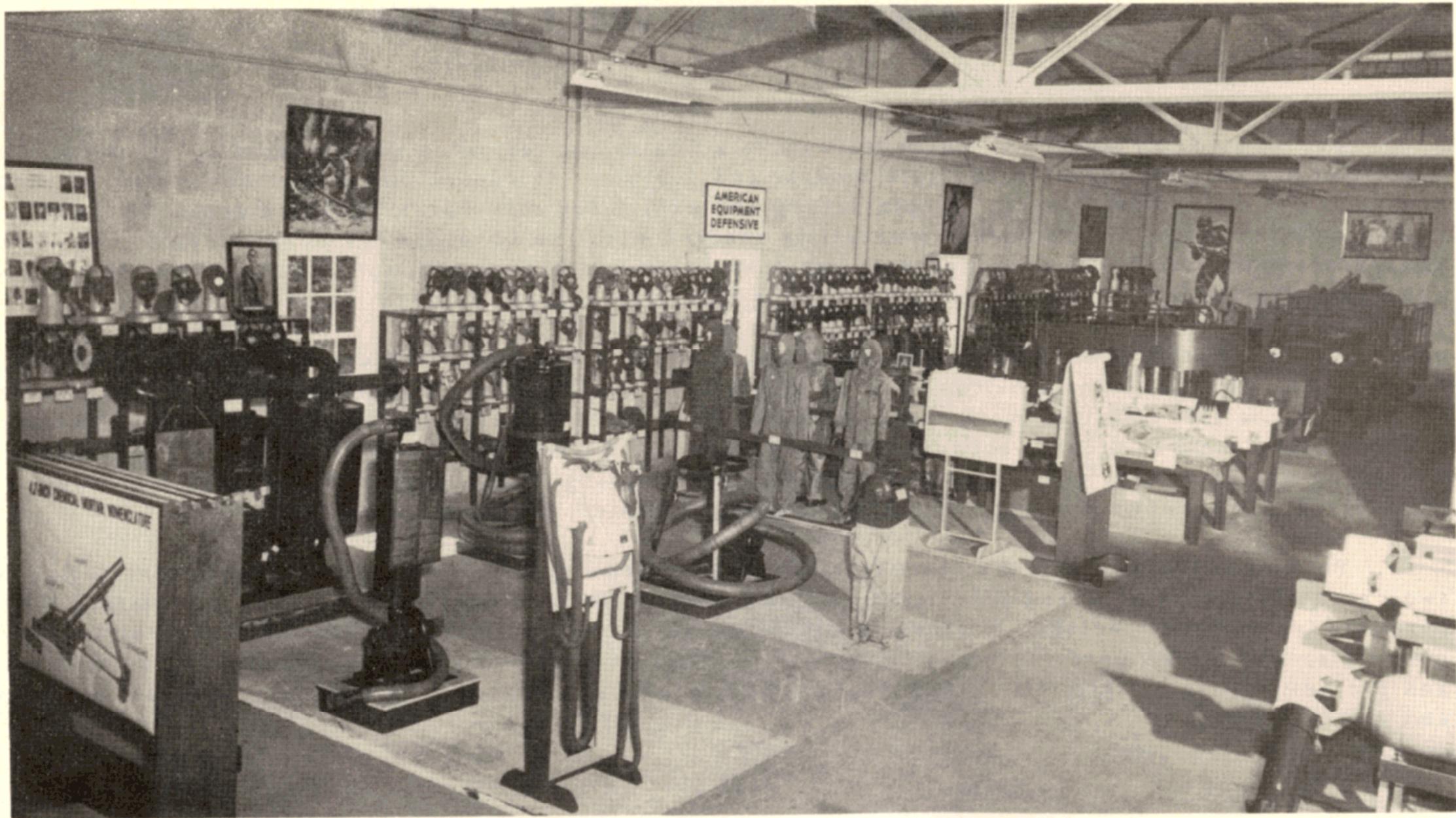
The Chemical Corps Museum is open Monday through Friday from 8:00 A. M. until 4:30 P. M., with personnel available at all times to furnish information or to conduct guided tours. Representatives of organizations are invited to consult with the curator to arrange for guided tours of large groups. Arrangements can also be made for tours on days and hours other than listed above. Telephone Edgewood 1000, Extension 21256.

U. S. ARMY CHEMICAL CORPS MUSEUM

The U. S. Army Chemical Corps Museum is a center for the preservation and display of various American and foreign chemical warfare models and devices. It houses the largest collection of such equipment in the United States. By preserving and exhibiting this materiel, the museum becomes a source of information for technical specialists charged with the development of new devices. Research and development scientists and engineers can learn what has been produced in the past and, thus guided, can avoid the waste of time and money resulting from unnecessary duplication of effort.

The museum is now housed in Building No. 53, Army Chemical Center, Maryland. At present, nearly 8,000 chemical warfare items are on display at this location. Equipment dating from 1900 to the Korean conflict illustrates the many different avenues of research in chemical warfare. The museum's collection was greatly enhanced in 1946 when the German Gas and Defense School at Celle, Germany, was captured, and the school's museum, containing 5,000 items from 22 countries, was transferred to Edgewood Arsenal, now Army Chemical Center, Maryland.

Technically speaking, the classification of chemical warfare materiel and equipment falls into two categories, defensive and offensive. Defensive materiel and equipment include gas masks, air purifiers for gasproof shelters, protective clothing, gas detection kits, gas alarms, decontamination materials, and smoke generators and smoke pots. Offensive materiel and equipment include mortars and projectors, flame throwers, grenades, artillery shells and rockets, land mines, and aerial bombs and smoke tanks.



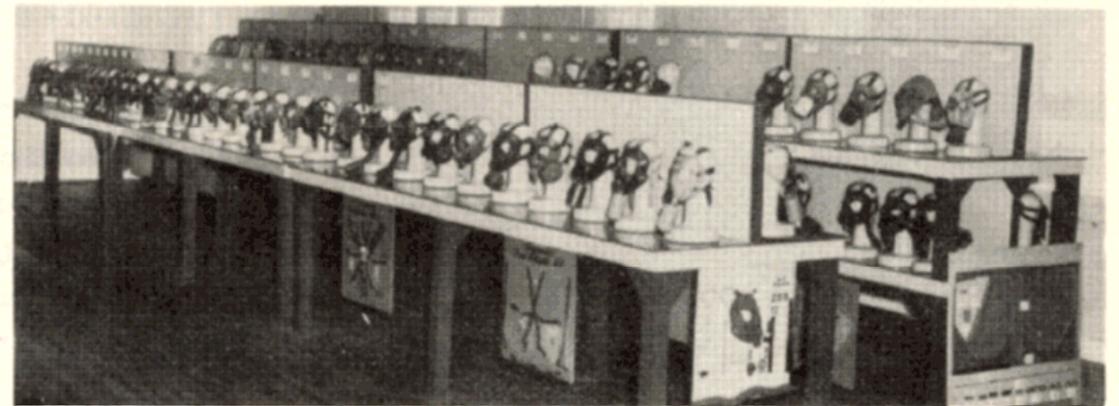
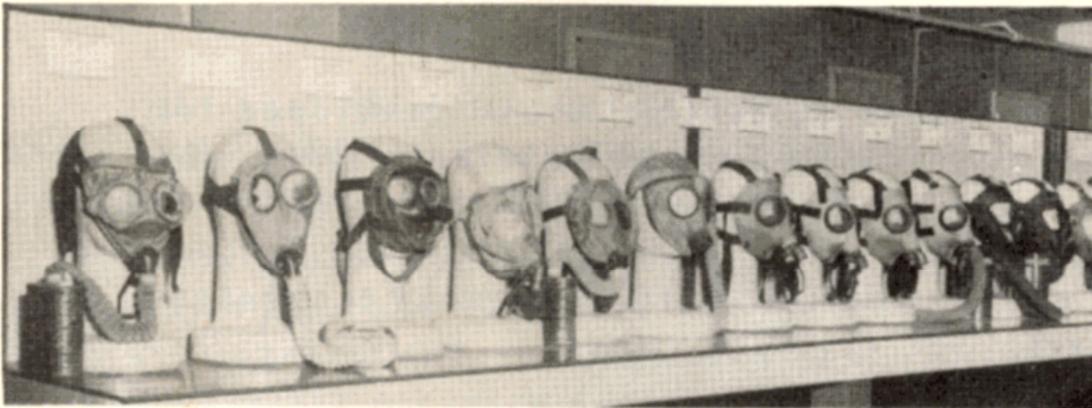
AMERICAN DEFENSIVE EQUIPMENT

AMERICAN DEFENSIVE EQUIPMENT



Prior to the entry of the United States into World War I, American scientists were busily engaged in developing a service respirator to counter the effects of poison war gases which the German Army had been using on the field of battle since 1915. By current standards, the earliest respirator, or gas mask, was a crude affair. From a modest beginning, however, there has been evolved a highly efficient piece of equipment, the field protective mask of today. The museum collection consists of nearly 200 masks illustrating the trend of technical development from the first models, which were made in 1917, to those which are standard equipment for the field soldier of today.

1917 -- CURRENT

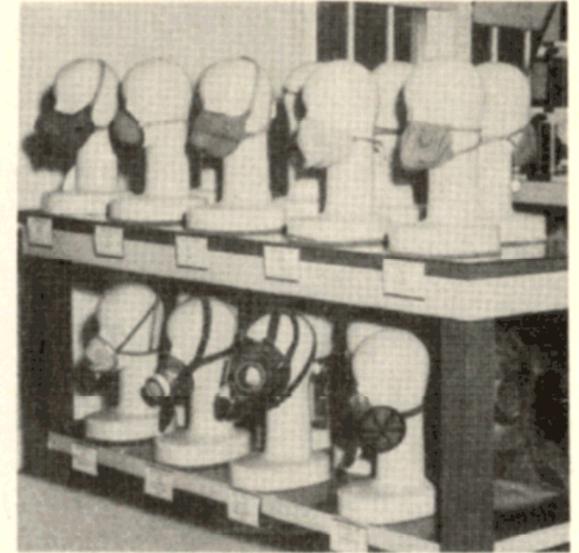


CHRONOLOGICAL EVOLUTION OF THE GAS MASK



CRAWFORD FROST MASK

An early American device to afford respiratory protection to combat troops was the Rev. Crawford Frost's apparatus. This interesting item consisted of a breathing tube attached to an air-purifying apparatus. The tube was held in the mouth and air was drawn through the filter. While this invention was not acceptable to the Army, it was a forerunner of the present-day American mask.



DUST RESPIRATORS



CIVILIAN MASKS

The Chemical Corps, realizing that respiratory protection was required for certain industrial operations, developed special-purpose respirators for protection against dusts and paint sprays.

Among some unusual masks on exhibit is one developed for children. In order to quiet a child's fear of donning a mask, this particular creation was fashioned to resemble Walt Disney's cartoon character, Mickey Mouse. This mask, complete with red button nose and large ears, is shown alongside the more commonly recognized adult civilian counterpart.



PROTECTIVE HOODS

Unusual climatic conditions (arctic or tropical) presented the need for specially designed masks. Various prototypes and experimental models are on display at the museum.

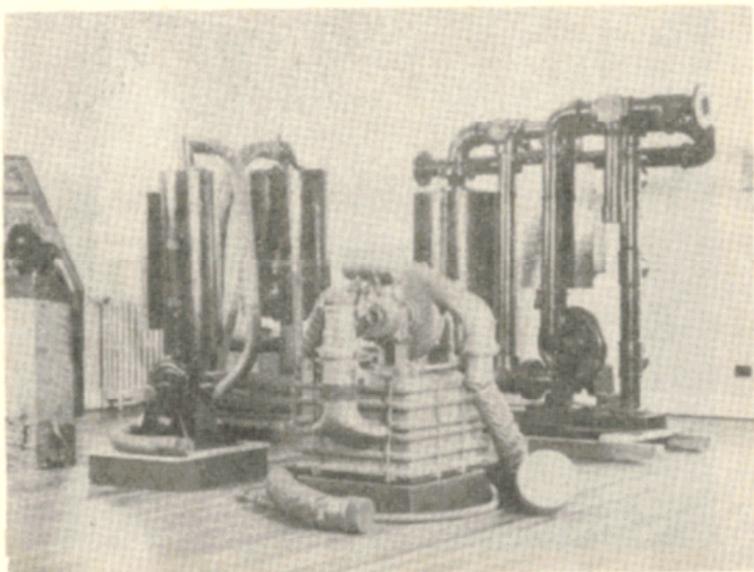
The protective mask protects only the respiratory organs, the eyes, and the face. For protection of the body generally against the action of vesicant (blistering) agents, which penetrate ordinary clothing readily in either liquid or vapor form, special protective clothing is required.



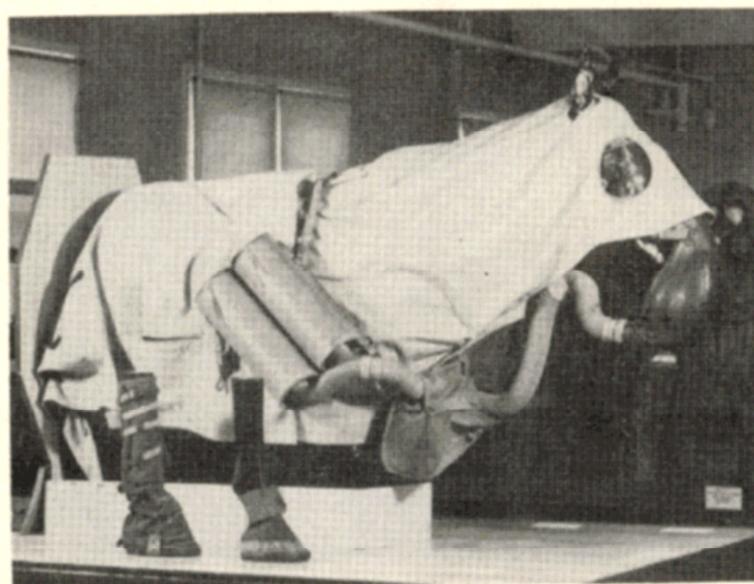
PERMEABLE PROTECTIVE SUITS



IMPERMEABLE PROTECTIVE SUITS



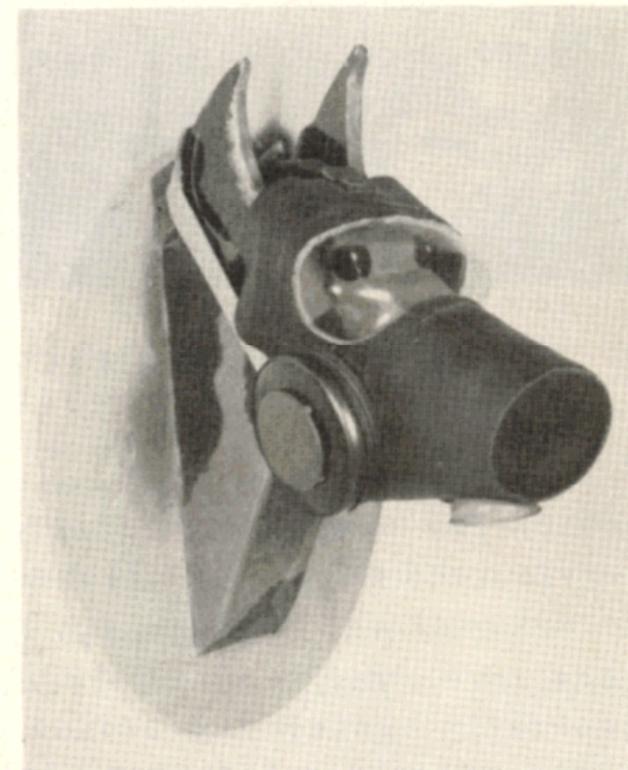
COLLECTIVE PROTECTORS



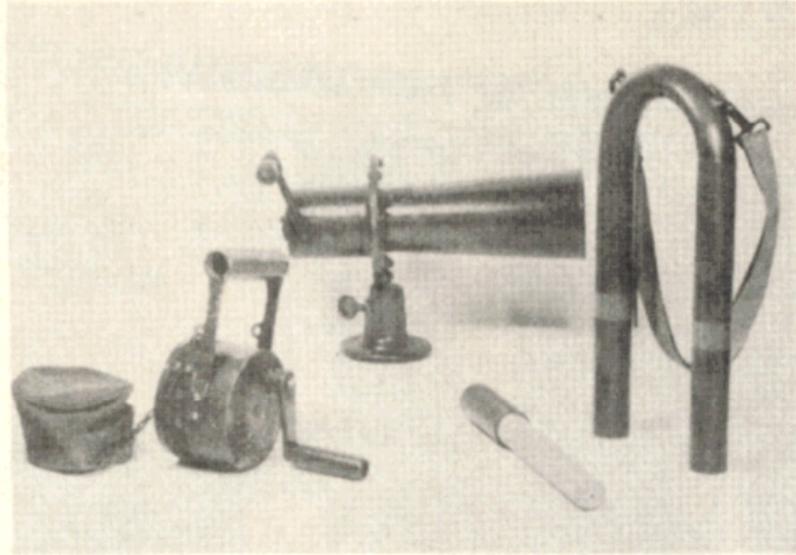
HORSE PROTECTIVE EQUIPMENT

Toxic gases of the persistent variety may be used to subject large areas to lethal concentrations of gas for long periods, possibly for several days at a time. Under such conditions, gas-proof shelters must be built so that work can be carried on and soldiers can eat, rest, and sleep without being encumbered by both protective masks and clothing. A filtration device called a collective protector (Filter Unit) contains apparatus for drawing air from outside the shelter and filtering out the toxic agent in the same manner as a protective mask canister.

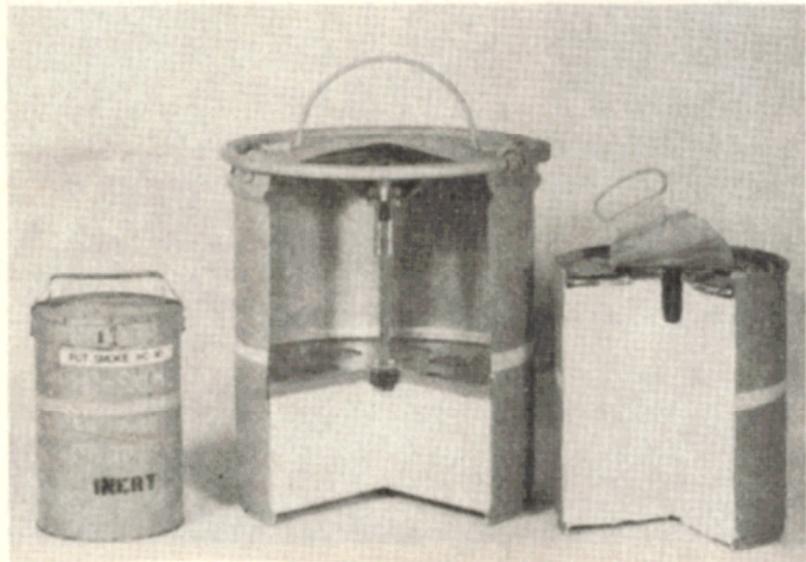
Other interesting items on display at the museum are the masks developed for animals, particularly those devised for horses and dogs. Protective equipment for horses includes covers and various types of boots and leggings.



GAS MASK FOR K-9 CORPS



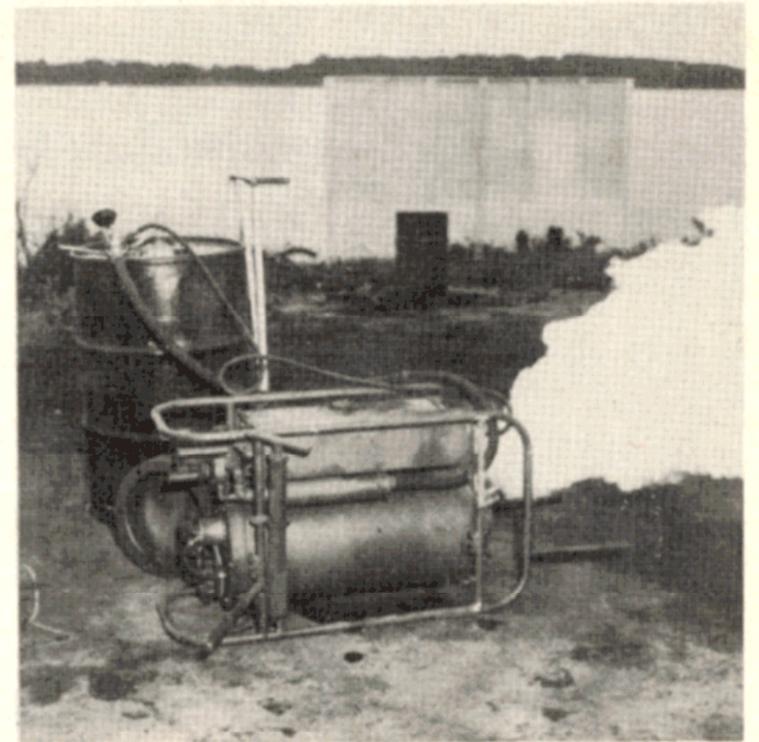
GAS ALARMS



SMOKE POTS

Various noisemakers are on display. These devices include gongs, sirens, and klaxons, all designed for use by sentries to alert personnel to the imminence of gas attack.

Perhaps the best known Chemical Corps item of defense is smoke-generating apparatus. The public, which has become acquainted with the operation of smoke pots and smoke generators through frequent news-reel presentations, is familiar with the manner in which troops on land and sea advance and withdraw under the protection of a generated smoke screen.

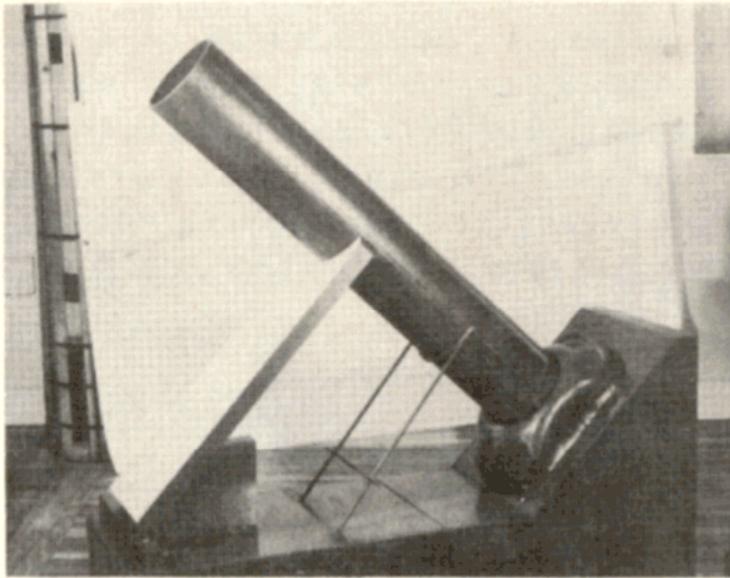


PULSE JET SMOKE GENERATOR



AMERICAN OFFENSIVE EQUIPMENT

AMERICAN OFFENSIVE EQUIPMENT



LIVENS PROJECTOR

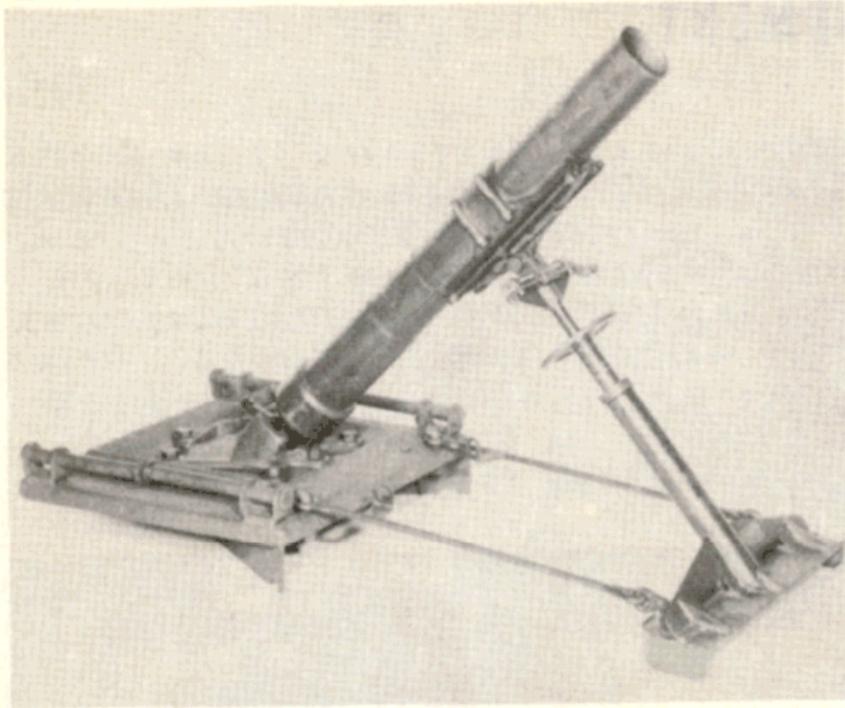
Prior to World War II, several modifications were made on the Livens Projector, which ultimately resulted in the weapon which proved so effective in Korea - the 4.2-inch mortar.

This mortar is a unique weapon which combines the simplicity and rapid fire of the old smooth-bore mortar with the range and accuracy of a rifled piece. The increased range and accuracy were secured by rifling the barrel and by the use of a true flight shell instead of a shell which tumbles in flight. The time required to set up the mortar was greatly reduced by using a base-plate which rests on the ground.

The mortar, a weapon originally developed by the Chemical Corps to project chemical shell, strikingly demonstrated its high capability in Korea. Now classified as an Ordnance item, the mortar is a descendent of a weapon invented by Captain Livens of the British Army during World War I. The weapon was essentially a large tube which was sunk into the ground. Detonation of a small charge in the bottom of the tube hurled a shell end-over-end for a short distance. The Livens projector left much to be desired in range, accuracy, and rate of fire.



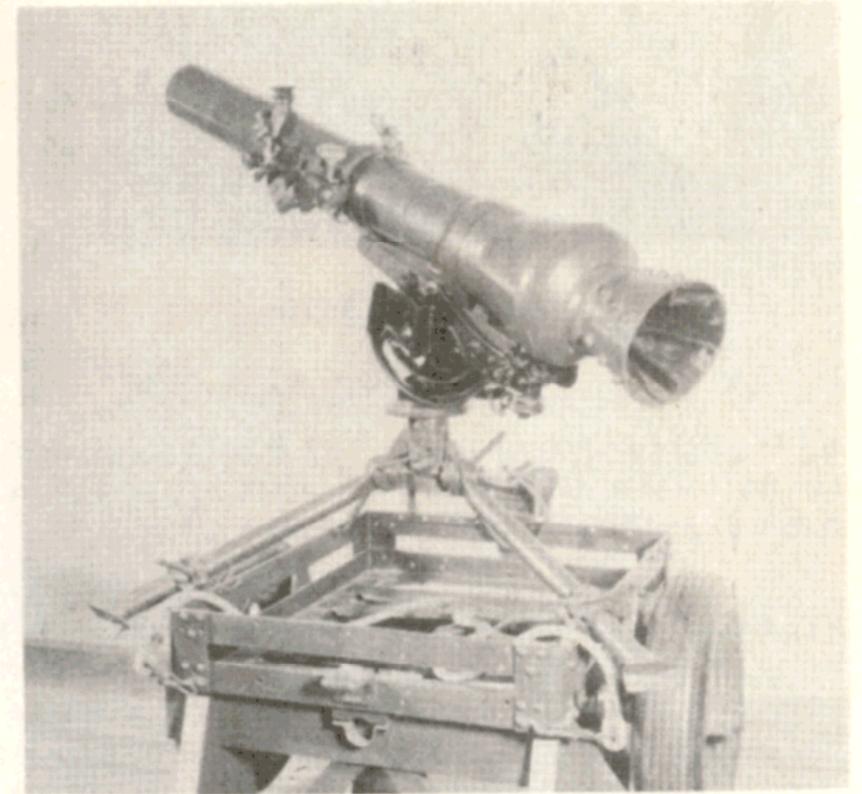
4.2-inch MORTAR EVOLUTION



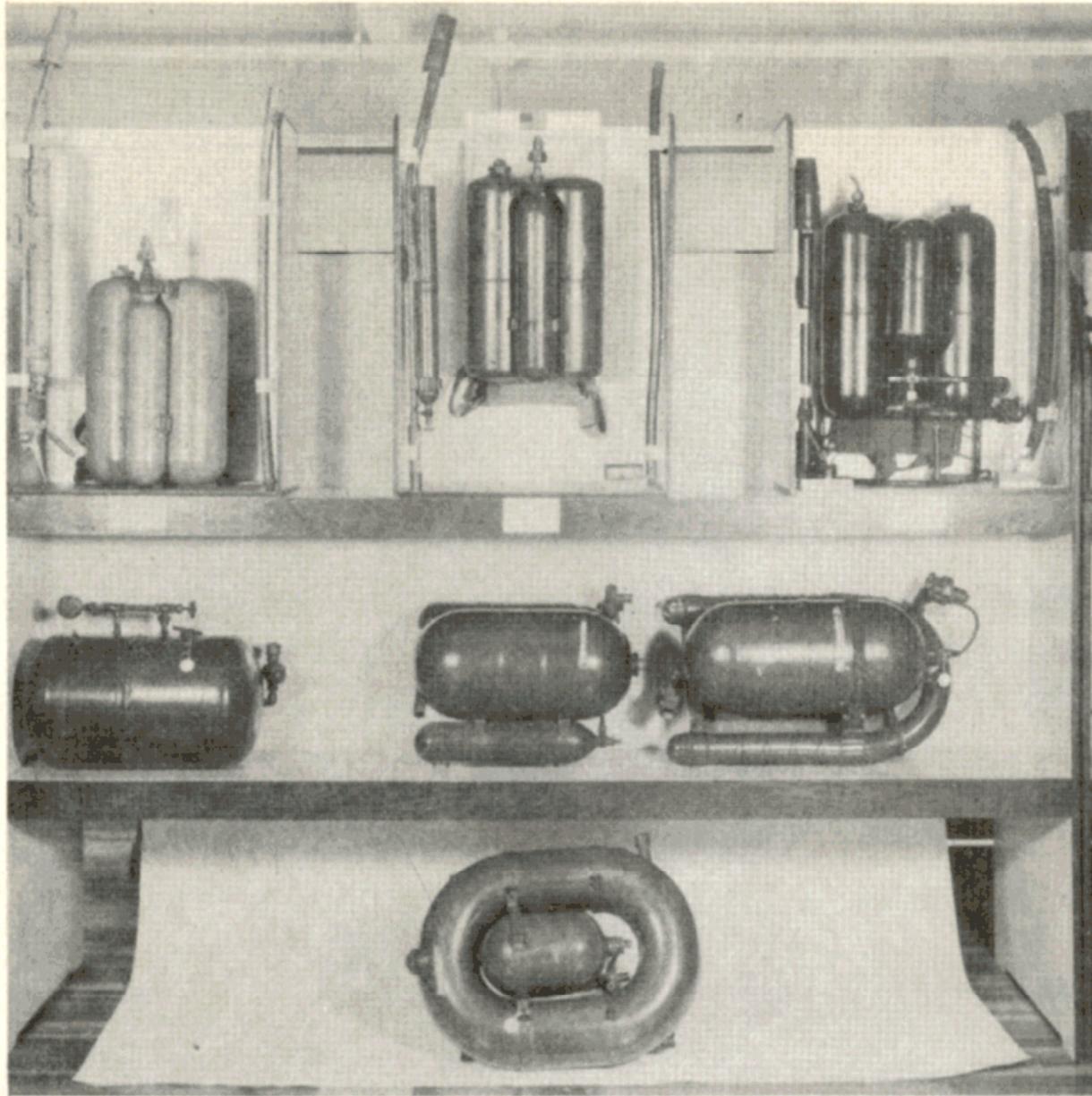
4.2-inch CHEMICAL MORTAR

One of the more interesting exhibits in the mortar section of American weapons is the recoilless mortar. This weapon represents an attempt to improve the 4.2-inch chemical mortar by eliminating the need for a heavy base-plate. This weapon was used in Italy during World War II, but limitations caused its obsolescence.

Among the latest mortars on display at the museum is the 4.2-inch chemical mortar (at left), a rifled, muzzle loading piece designed for high-angle fire and capable of a maximum range of 4,000 yards. It can be fired at a sustained rate of fire of five rounds per minute. If not emplaced in soft ground, it can be fired for short periods at the rate of 20 rounds per minute. The range is adjusted by changing the elevation, by varying the propellent charge, or by a combination of these factors.



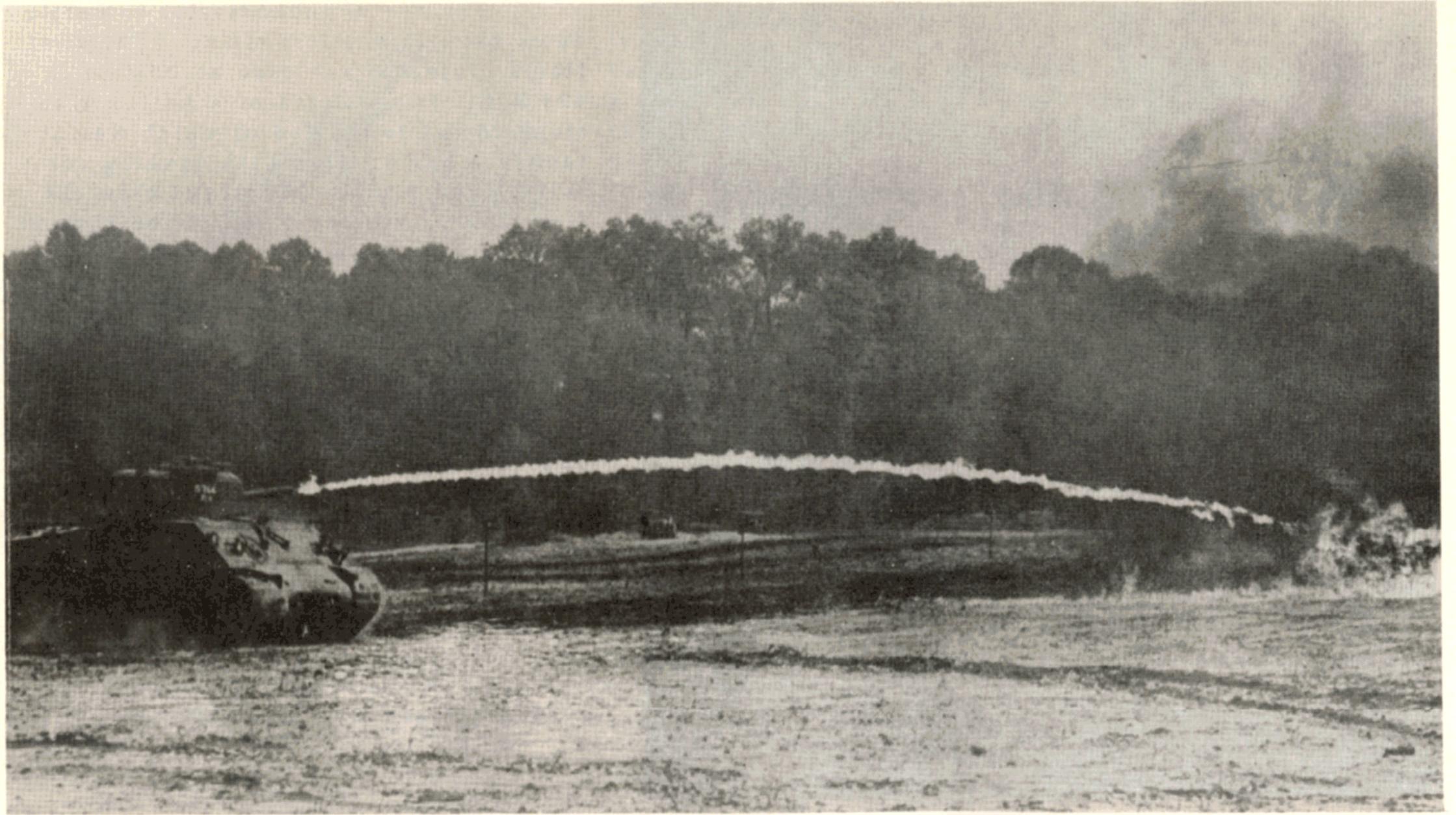
4.2-inch RECOILLESS MORTAR



FLAME THROWERS

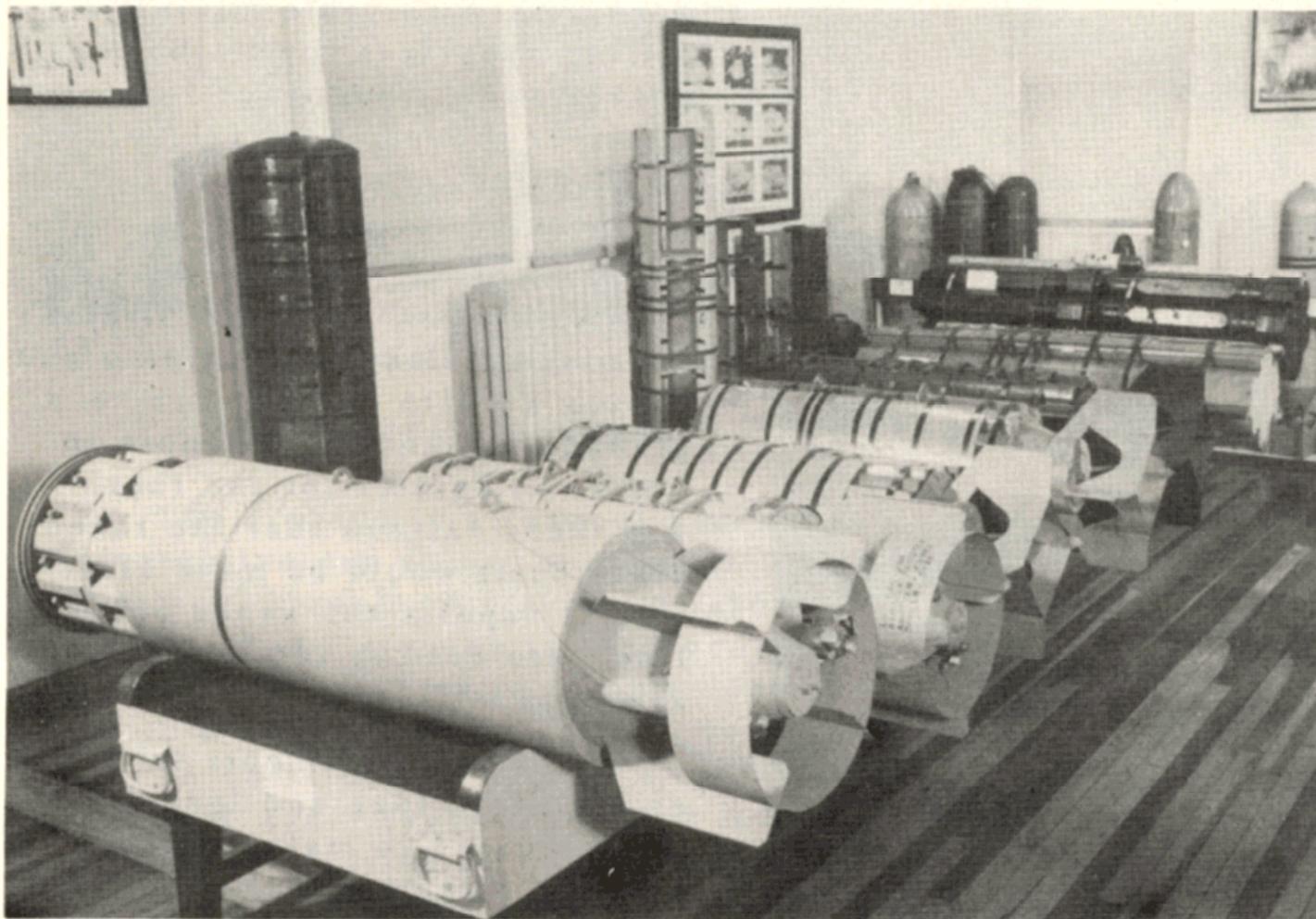
The use of incendiaries in battle dates back to earliest times. The first flame projector was used at Delium in 424 B. C. It consisted of a hollow tree trunk to the lower end of which was attached a basin filled with glowing coals, sulfur, and pitch. A bellows blew the flame from the tree trunk in the form of a jet, setting fire to the enemy fortifications and aiding the besiegers in the capture of the city.

While the advent of firearms temporarily interrupted the use of fire, technological advances have again made incendiary weapons important in warfare. The crude device of the Greeks has evolved into the compact and efficient lethal weapons on display.

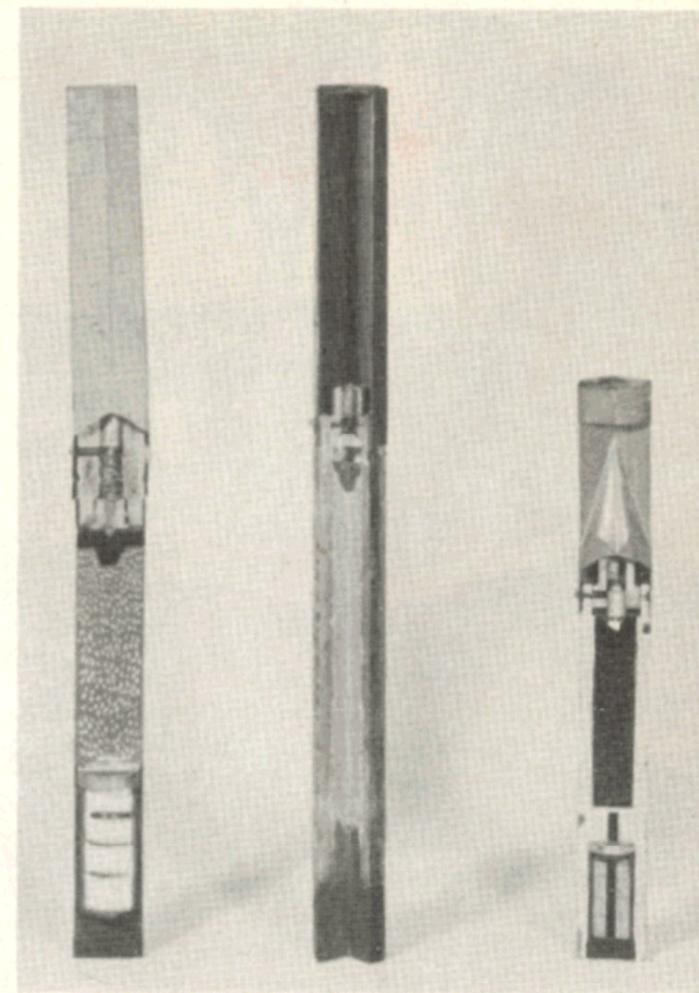


FLAME-THROWING TANK

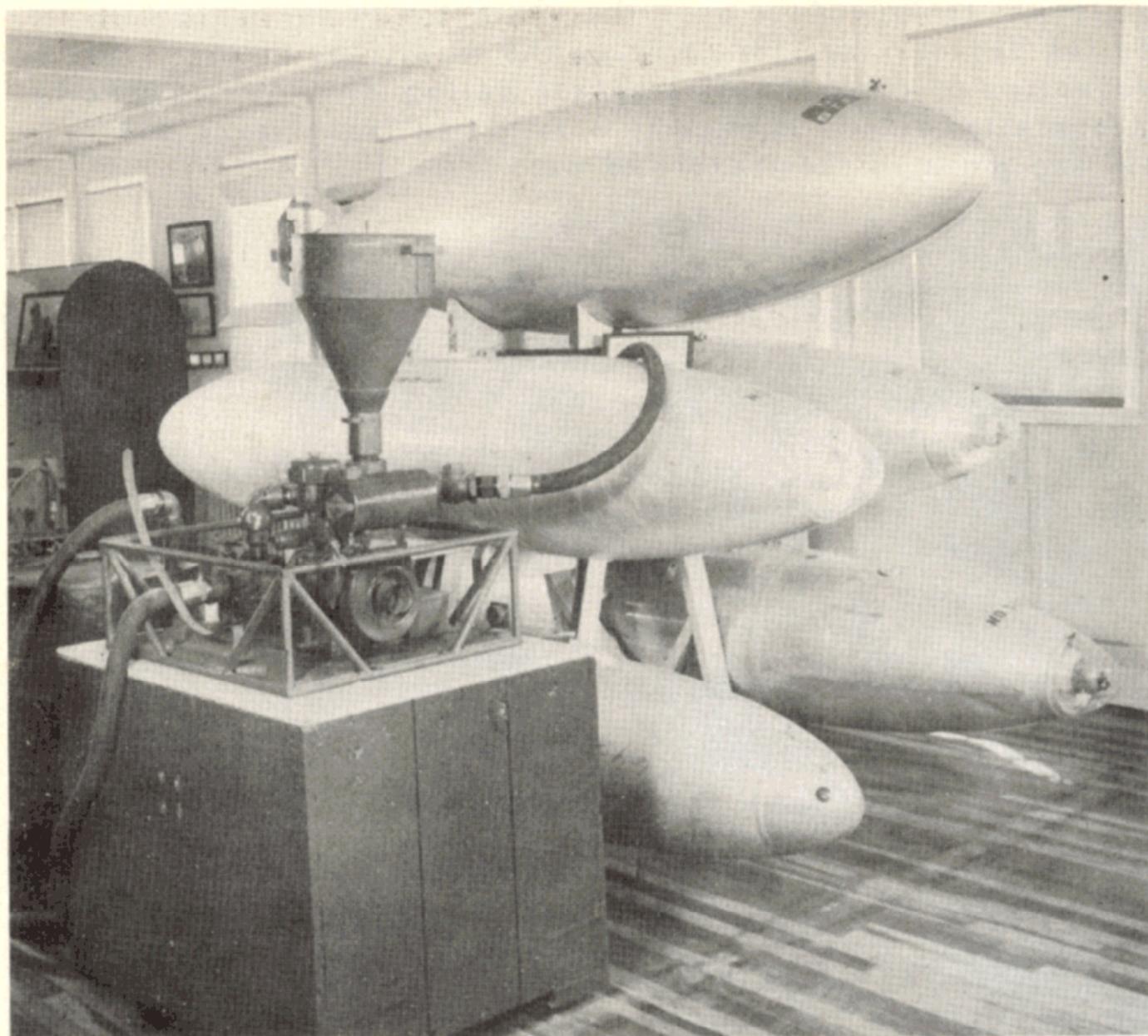
The effectiveness of incendiaries in war is dependent upon the character of the materials employed, flammability of the target, and the devices used for carrying the munitions to the target and setting them in action there. The introduction of the military airplane during World War I greatly increased the field of application of incendiaries, since it became possible to reach large and vulnerable incendiary targets at practically any point in the theater of war.



CLUSTERS OF INCENDIARY BOMBS



INCENDIARY BOMBS

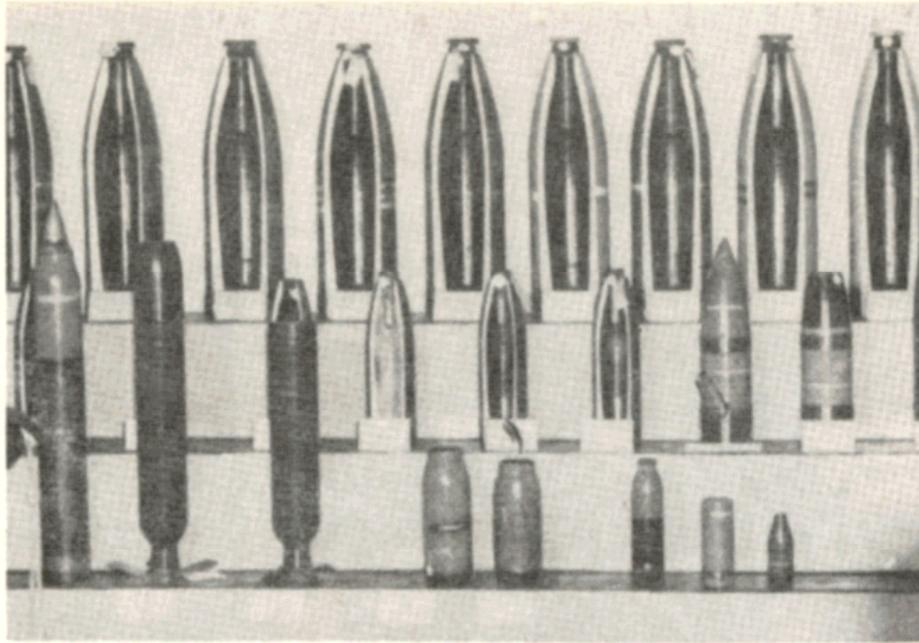


FIRE BOMBS AND THICKENED FUEL MIXING UNIT

Another type of incendiary bomb is the napalm (jellied gasoline)-filled fire bomb displayed here with a portable mixing and filling apparatus. This bomb gained wide prominence in Korea where it proved to be very effective against armor, bunkers, and personnel.

Originally, this munition consisted of an auxiliary airplane fuel tank filled with gasoline and having a white phosphorous hand grenade attached to the nose to act as an igniter for the fuel. It was then realized that the incendiary burst would be more effective if napalm-thickened gasoline were used as the incendiary agent.

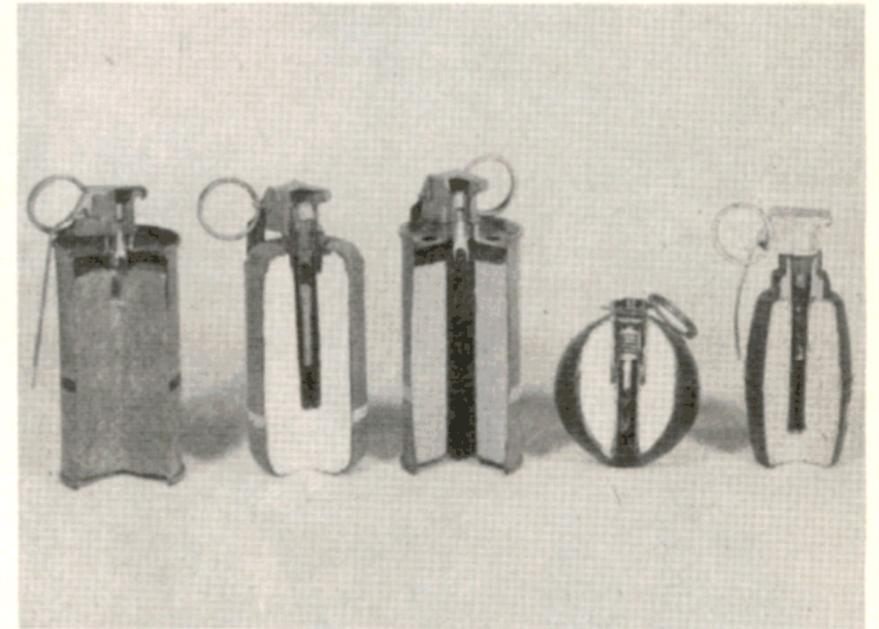
Later refinements included an improved fuze and igniter, which helped to make the fire bomb so effective.



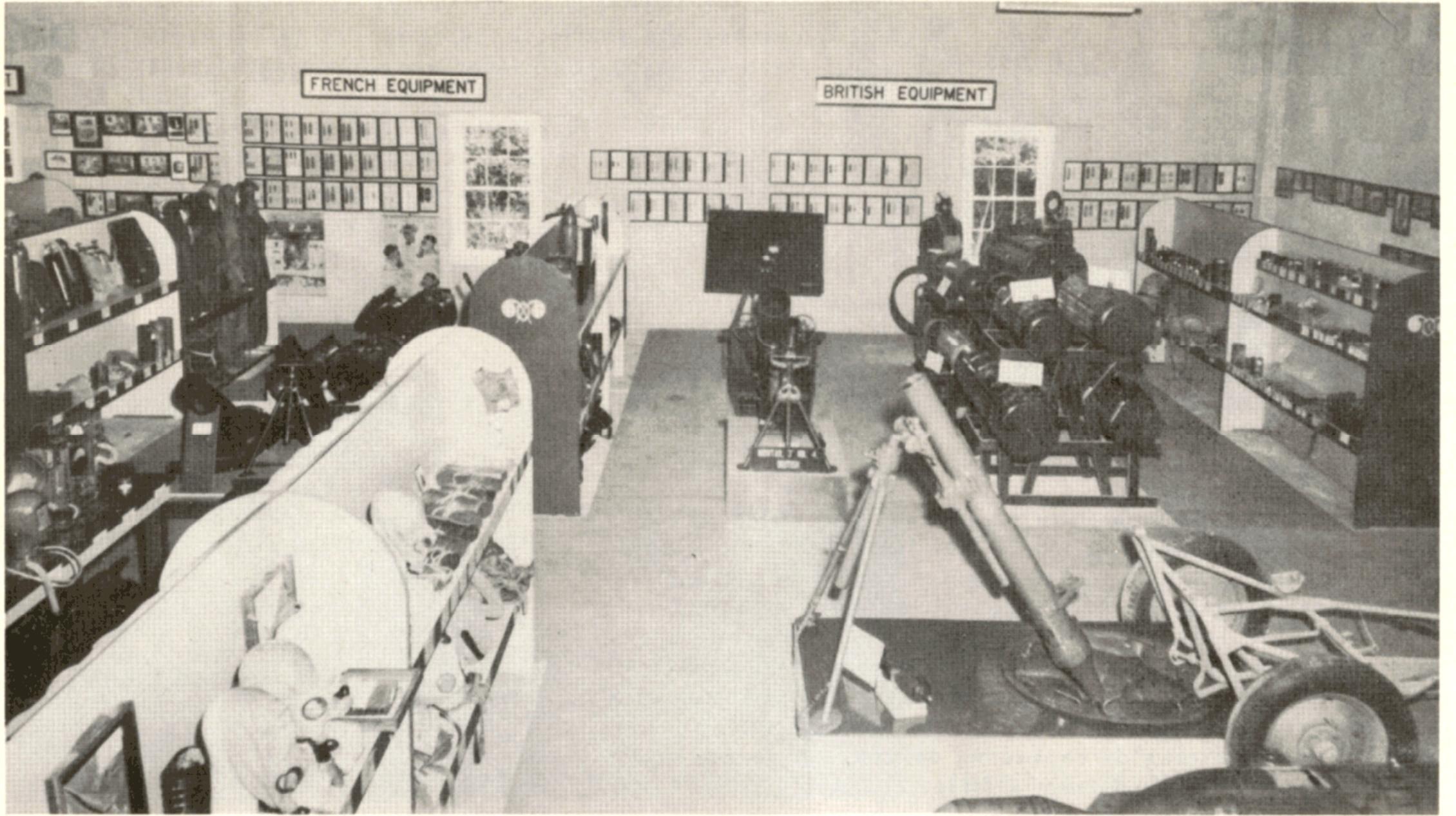
CHEMICAL-FILLED SHELLS

The grenade is a form of ammunition which came into extensive use during World War I, largely as a result of the requirements of trench warfare. Within certain limitations, the grenade is a convenient type of ammunition to enable infantry to complement their primary weapons with a small missile similar, in general, to a shell or bomb. A chemical grenade is a grenade that is filled with a chemical agent (gas, smoke, or incendiary) which is dispersed by an igniting or exploding device. A grenade is thrown by hand or fired from a rifle.

The German gas attack at Ypres, 22 April 1915, proved the inefficiency of releasing gas from cylinders and allowing it to float over enemy positions. Chemical agent shells, fired from artillery pieces and mortars and caused to burst among enemy positions, have proven a more effective method. Several types and sizes of chemical agent shells are on display at the museum.

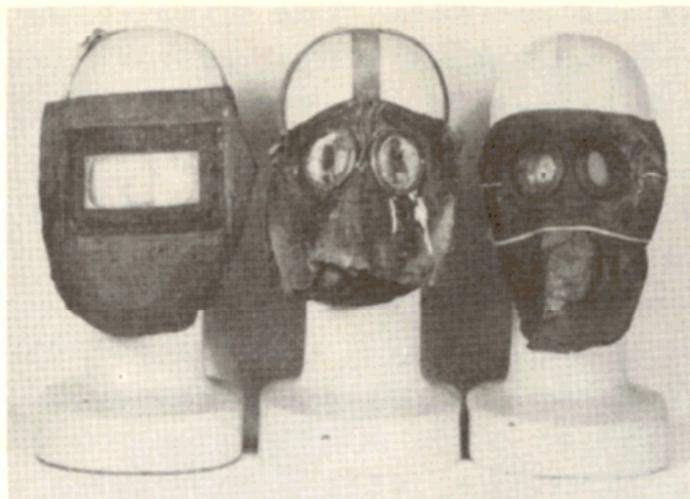


CHEMICAL-FILLED GRENADES

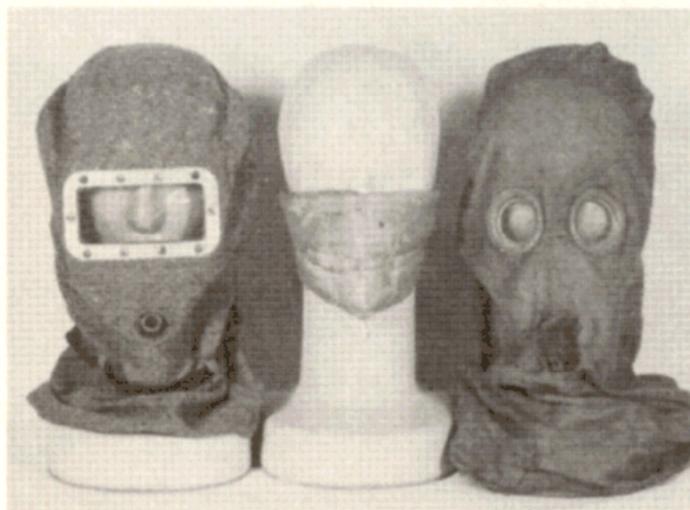


BRITISH AND FRENCH EQUIPMENT

BRITISH AND FRENCH EQUIPMENT



FRENCH WORLD WAR I MASKS



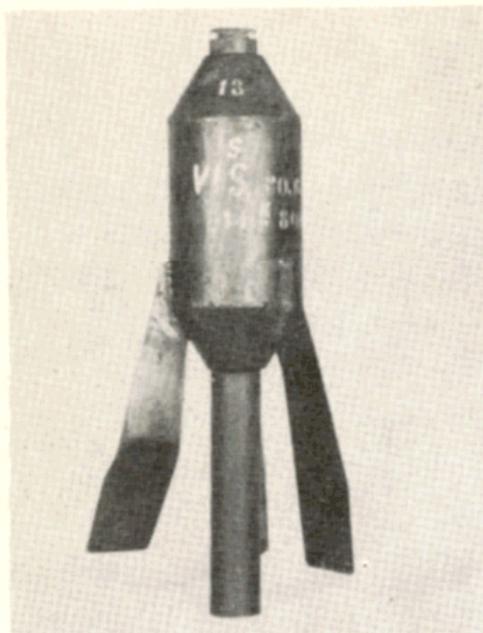
BRITISH WORLD WAR I MASKS

In 1915 the British and French were in the unfortunate position of having to develop gas masks while their troops were actually under gas attack. The Germans, once they had introduced gas, made every effort to hold the initiative. With the introduction of each new gas, the Allies had to modify their masks. Finally, with introduction of mustard (blister) gas in 1917, the British masks took on the appearance of hoods to further protect the head and face.

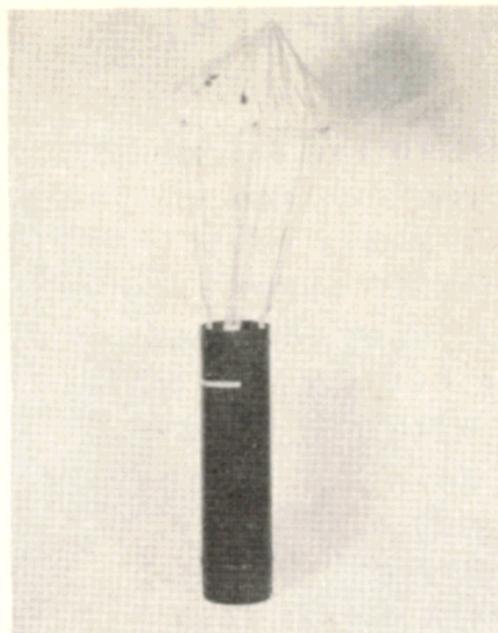
Following World War I, the British set about to improve their protective equipment, and at the outbreak of World War II they had developed a practical field mask offering adequate protection from gas.



BRITISH MASK



LAND MINE



INCENDIARY BOMB
(Scatter Type)

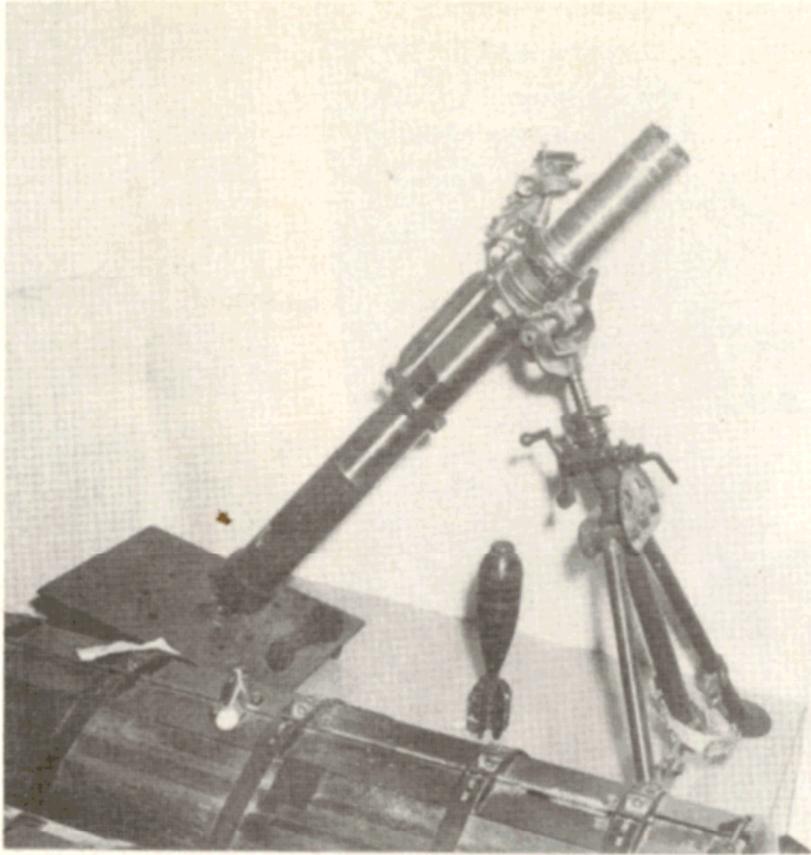
The chemical land mine finds its greatest use in defensive missions - particularly withdrawals, delaying actions, and retirements. The mine slows down advancing troops, who must either remove or neutralize it or take alternative routes around the mined areas.

There are two types of incendiary bombs, the intensive, for concentrated industrial plants, and the scatter type for covering large areas. The British originated the idea of small scatter bombs in World War I. In principle, this little bomb, shown here, was similar to both mortar and projectile. It carried a cartridge, very much like a shotgun shell, which dropped on the striker point in the base of the bomb body as the bomb landed. This actuated the cap, which simultaneously ejected the cartridge and ignited an incendiary charge of thermite. In actual use it was found that the impact upon landing caused numerous duds. By incorporating a parachute it was possible to lessen the landing impact but still activate the fuze.

British chemical-filled grenades are similar to American types both in filling and mode of operation.



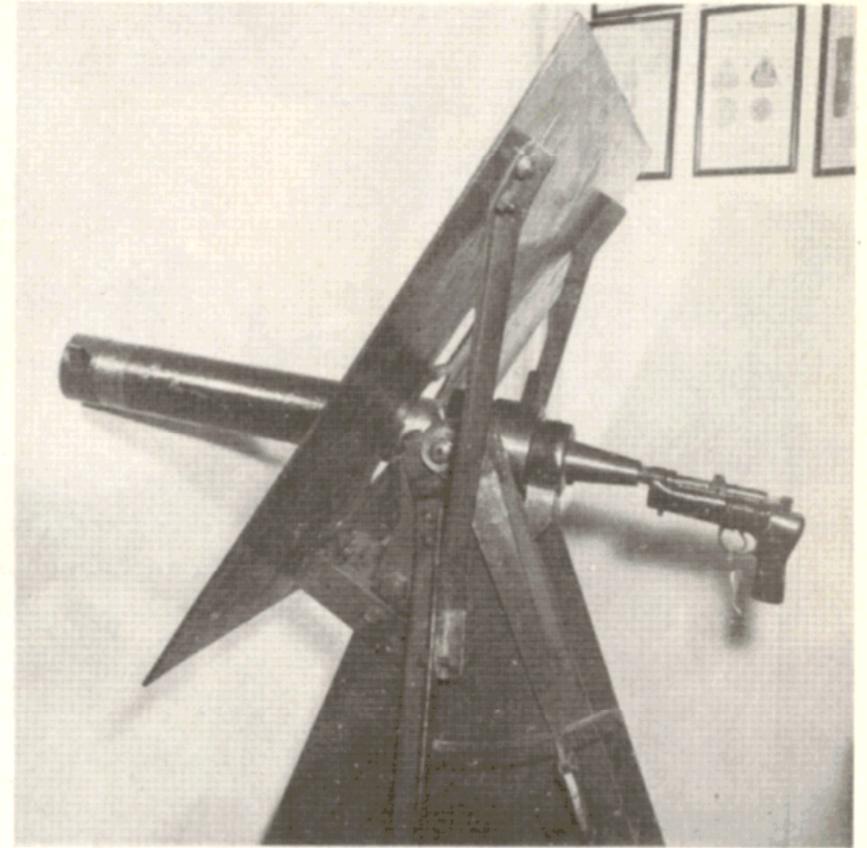
BRITISH GRENADES



STOKES MORTAR

A variation of the mortar was developed by Great Britain for mounting on ships. In this unusual piece, the shell is loaded into the muzzle of the gun. The propellant charge of the shell is initiated by a small-bore cartridge fired from the pistol mechanism at the rear of the gun. Recent developments in naval ordnance have made this weapon obsolete.

During World War I each principal army used a light trench mortar for close support of infantry. In the British Army the mortar was known as the 3-inch Stokes mortar. It was a smoothbore, muzzle-loading piece weighing 110 pounds. When first introduced, it was intended for high-explosive ammunition; but with the increasing tactical use of gas and smoke, chemical agent shells were developed.



NAVAL GUN



GERMAN DEFENSIVE EQUIPMENT

GERMAN DEFENSIVE EQUIPMENT

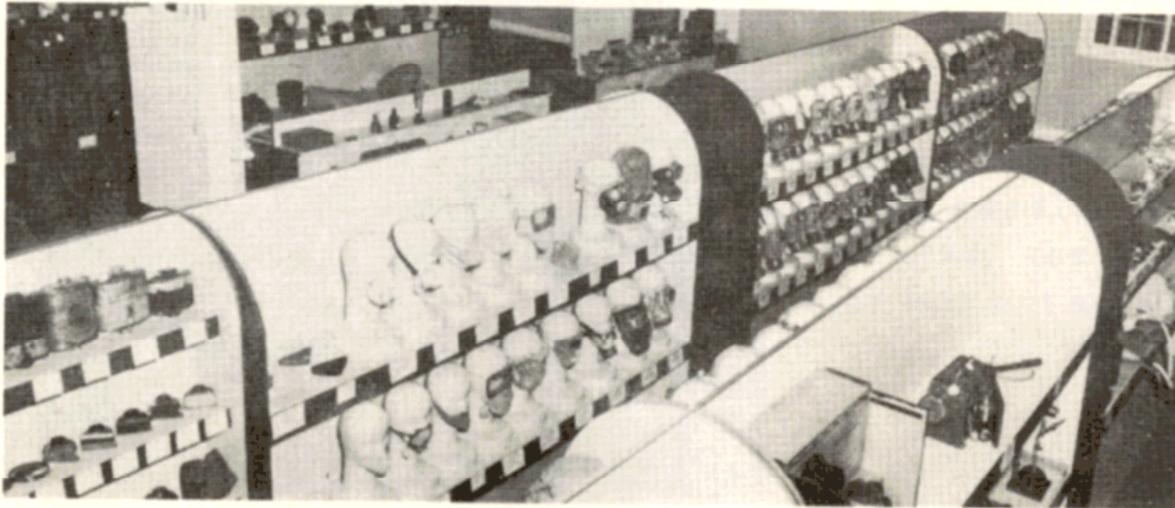
The earliest known mask was designed and developed in Germany in 1885 to aid civilian firemen in their work, enabling them to escape the choking smoke of a fire. This quaint mask has built-in glass wipers with which the wearer could wipe off moisture that collected on the inside of the eyepieces.



FIREMAN'S MASK

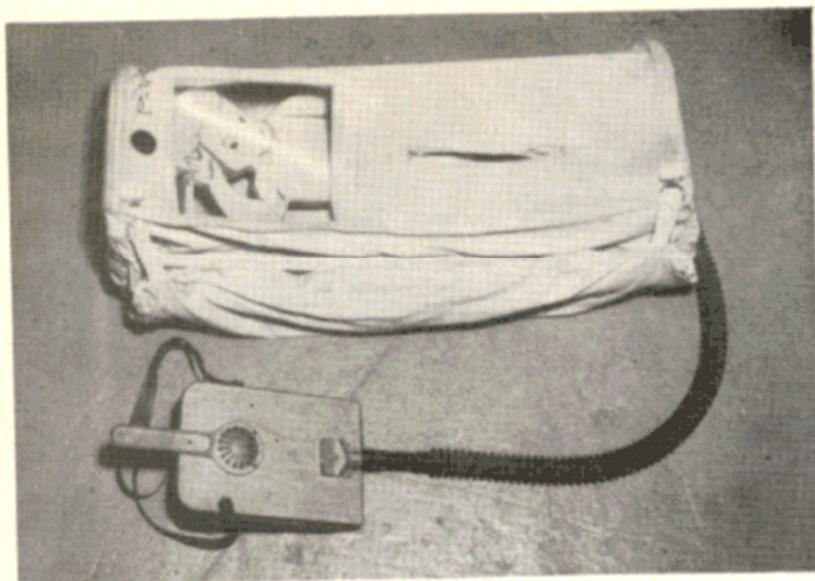


GERMAN OPTICAL AND SERVICE GAS MASKS



GERMAN GAS MASKS

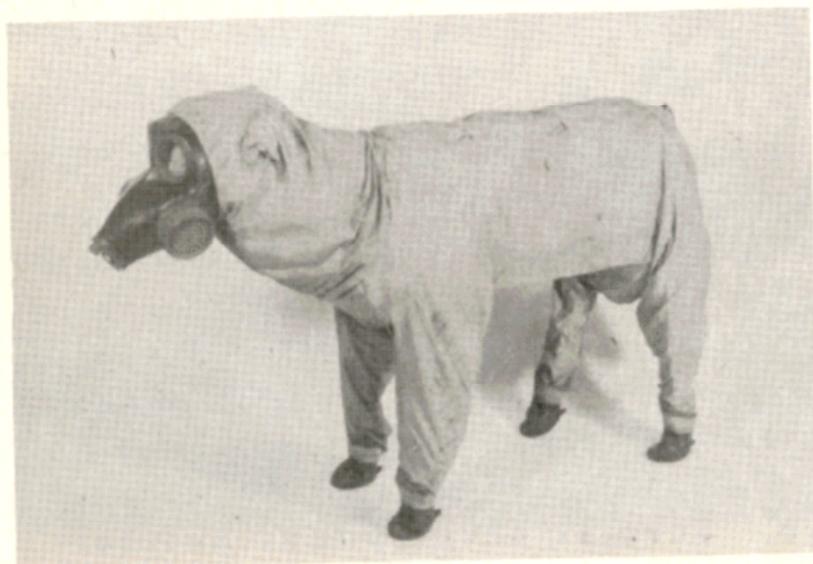
The German chemical industry pioneered in the development of respiratory protective equipment, and with the introduction of gas warfare it was prepared to supply the army with protective devices. As new war gases were produced, changes were made in respirator design. World War II found the Germans ready for gas warfare. Several development and service masks are on display at the museum.



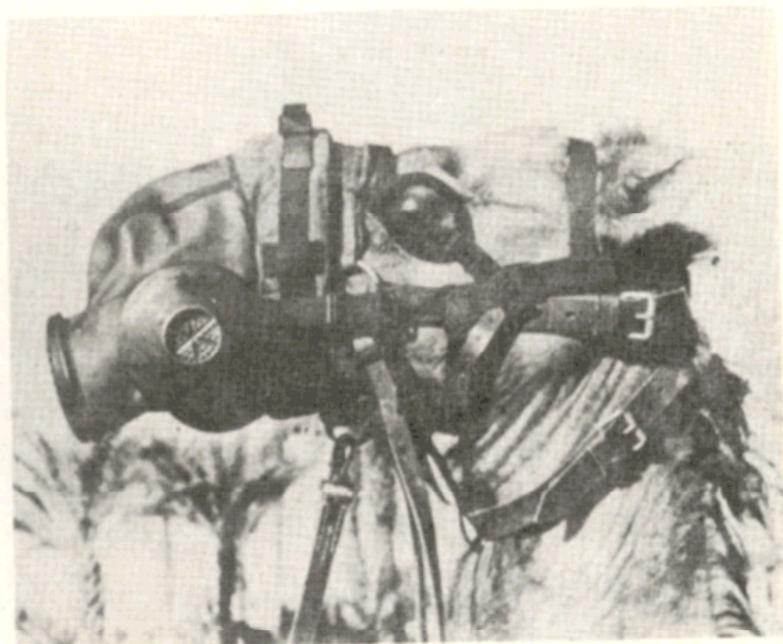
GERMAN INFANT PROTECTOR

Fearing retaliatory gas attacks upon cities, German scientists concerned themselves with civilian protective items, the most interesting of which was an infant protector. The child was placed inside the equipment (as illustrated), and purified air was pumped into it by means of an attached bellows.

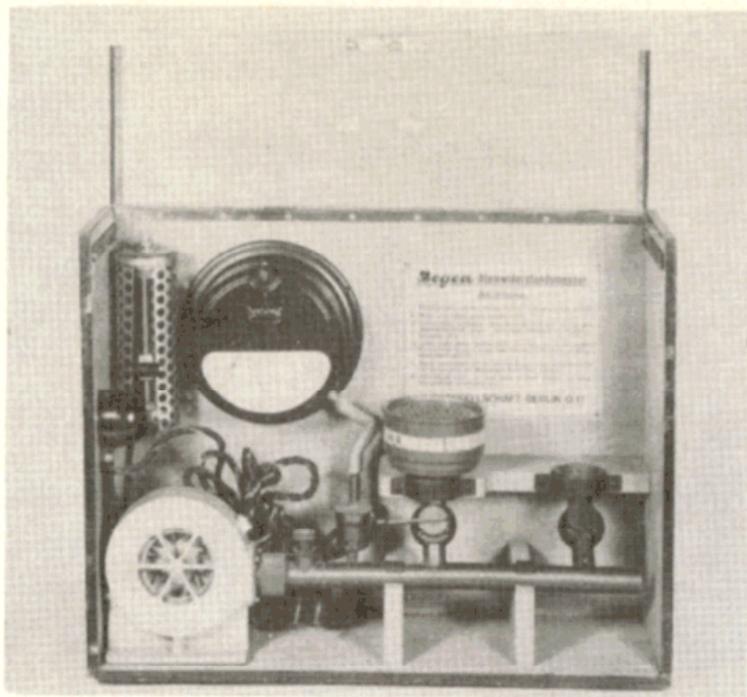
The Germans did not neglect their animals, either. In fact, they were far ahead of many other nations in this respect. They developed a gas mask for a camel, probably with the intent of employing it, if necessary, in the campaigns of the Afrika Korps. Masks were also developed for dogs and horses. A model dog equipped with protective clothing and gas mask is a part of the museum display.



DOG PROTECTIVE EQUIPMENT



GERMAN WORLD WAR II CAMEL MASK



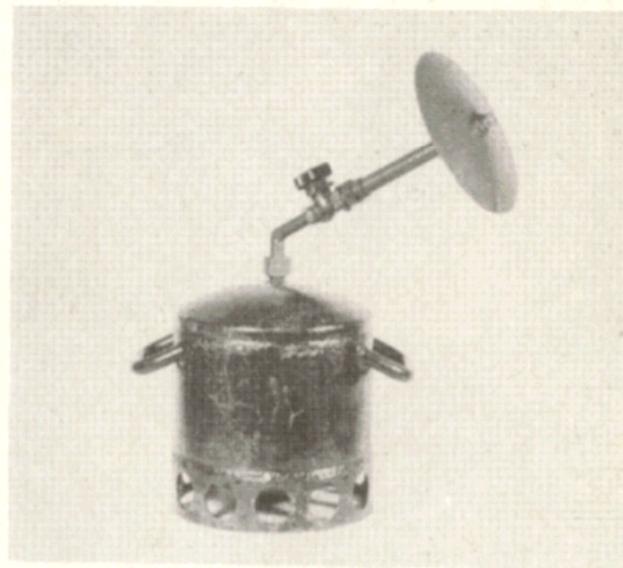
CANISTER TESTING APPARATUS

A novel device, though not as effective as a smoke generator, is the German smoke sprayer, designed for close support of the infantry. Its compactness and carrying handles made it particularly suitable for this purpose. However, the infantry was hesitant to employ smoke, and this device was not used extensively.

A protective mask can be used only so long as its canister continues to filter and neutralize toxic gases. When the canister is no longer capable of performing this function, the mask is useless until the old canister is replaced by a fresh one.

Canister-testing apparatus is necessary to evaluate the protective properties of canisters and to estimate the effective penetration of potential agents.

Examples of such devices will be found exhibited at the museum.

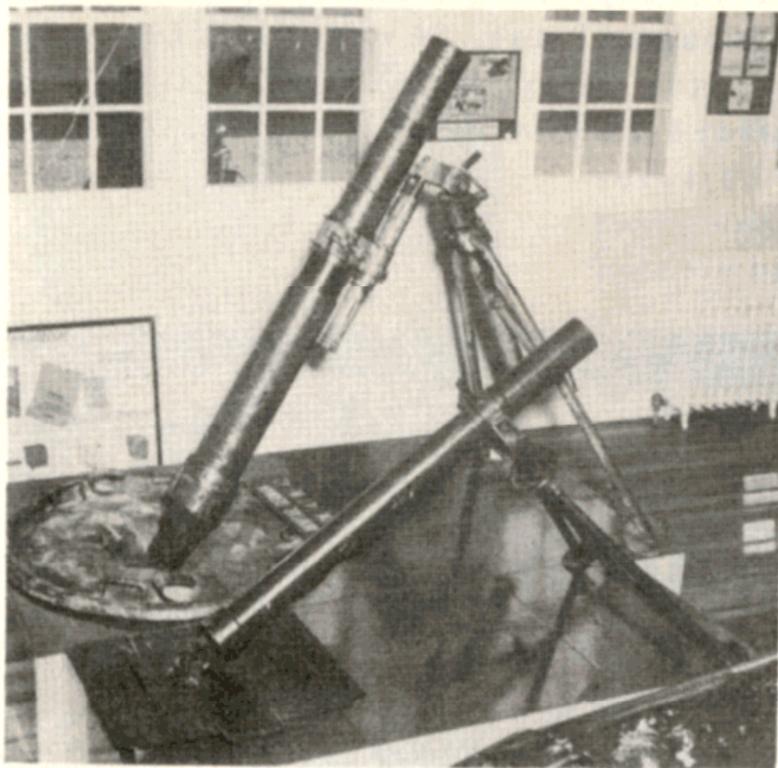


SMOKE SPRAYER



GERMAN OFFENSIVE EQUIPMENT

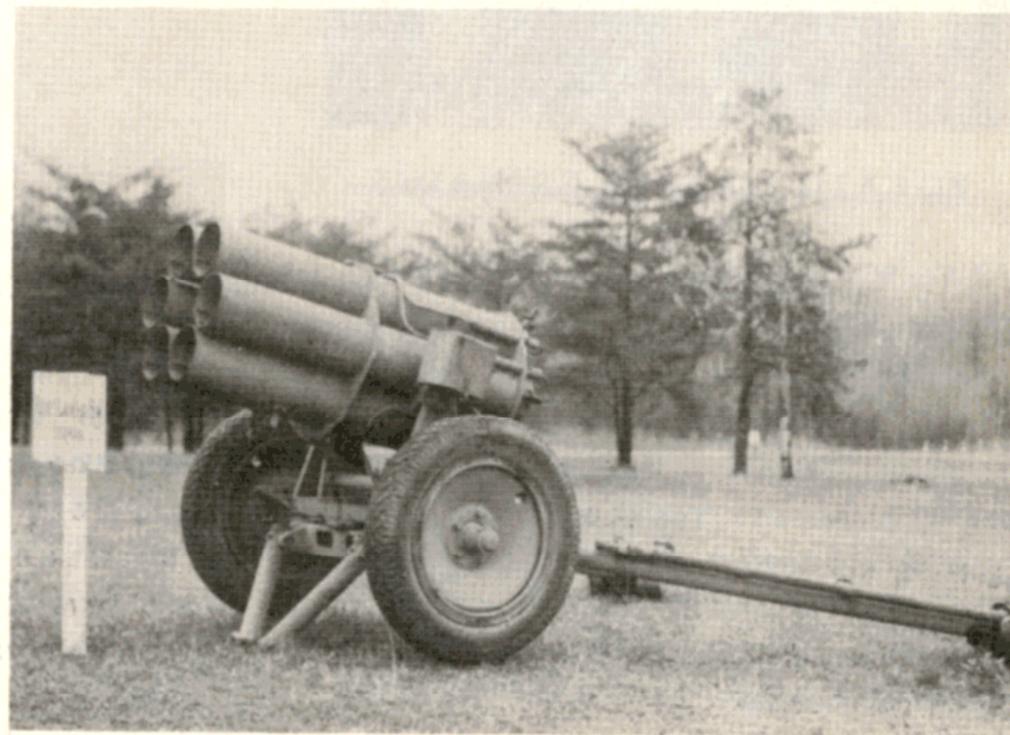
GERMAN OFFENSIVE EQUIPMENT



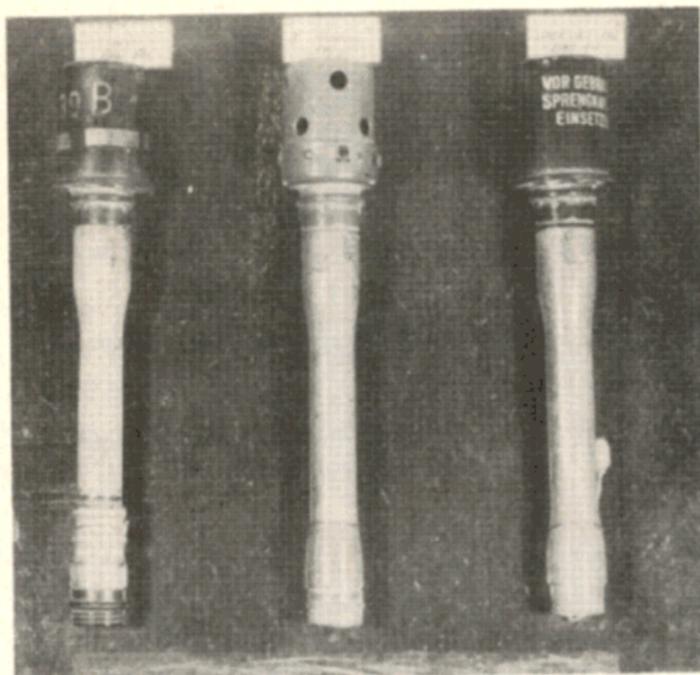
CHEMICAL MORTARS

Germany's experimentation with new weapons led to the development of this 15-centimeter rocket launcher. This weapon was used extensively on the Russian front in World War II. Although chemical projectiles were developed for this launcher, no toxic-agent rockets were used.

When, in 1915, World War I had settled down to a virtual stalemate, the Germans realized that they could not long endure in a war of attrition. Called upon to furnish new weapons, the German chemical industry developed toxic gases. The early means of gas dispersal (releasing it from cylinders and allowing it to float toward the enemy) proved unsatisfactory. Search for a better method of delivery led to the development of chemical mortars.



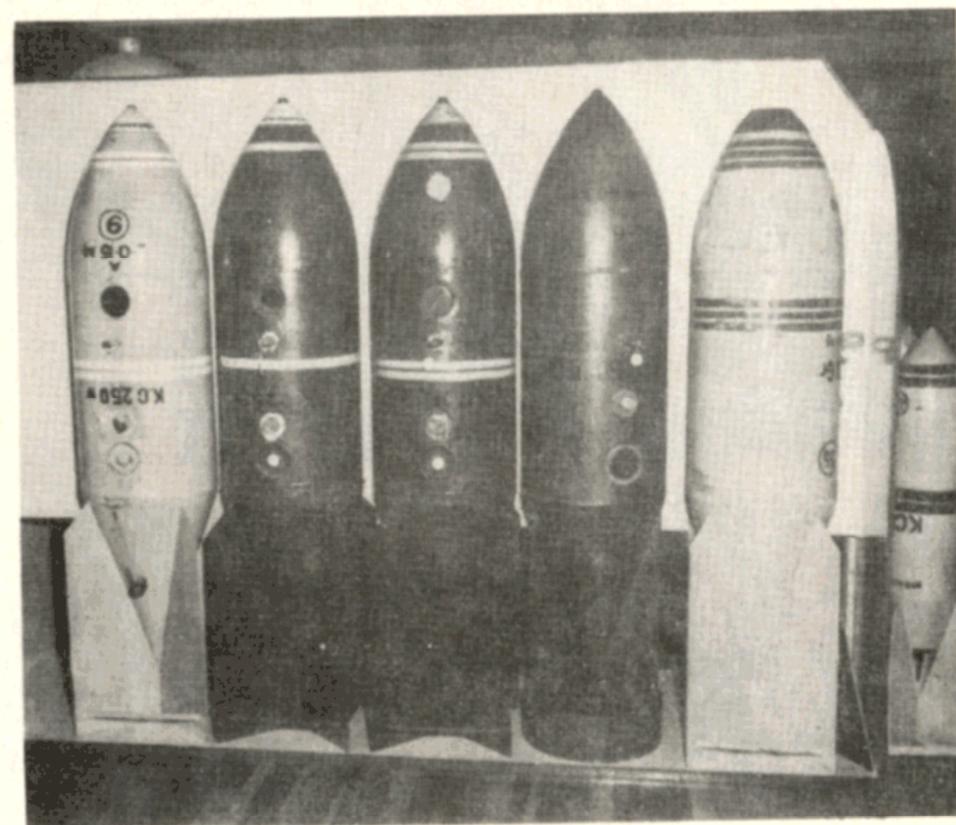
15-centimeter ALL-PURPOSE ROCKET LAUNCHER



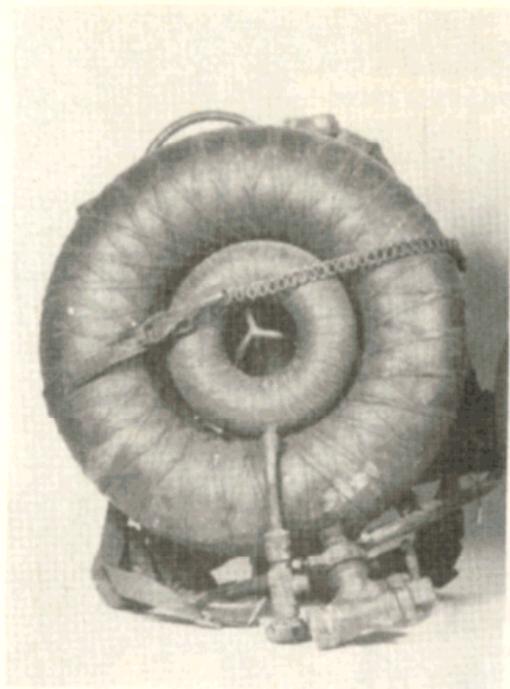
POTATO MASHER GRENADES

The German potato-masher grenade of World War I was very effective as an antipersonnel weapon when loaded with high explosive. It was less effective as a chemical munition, however. Because it held such a small amount of gas, it was effective only in confined areas. Since much of the early warfare was in the open, these grenades were soon discarded as chemical weapons.

Chemical bombs have the same general appearance as demolition bombs, except that they are painted after the same system of marking as other chemical-filled munitions. They are released from the same type of bomb racks as other bombs. Moreover, since bombs do not rotate in the air as do artillery shell, the difference in ballistic properties between a liquid-filled bomb and a solid-filled bomb becomes negligible, whereas in artillery shell the difference is considerable.



CHEMICAL BOMBS



DOUGHNUT-SHAPED
FLAME THROWER

Blitzkrieg war as introduced by the Germans in World War II required small portable versions of larger weapons that could be carried by airborne troops and tank-riding infantry. The German single-burst flame thrower FM. W. 46 is an example of this type of development. Weighing only 6.4 pounds loaded, this flame thrower is capable of firing a 2-second burst over a maximum range of 100 feet. This weapon was used extensively against bunkers, pillboxes, and roadblocks.

The German portable flame thrower of World War I was a cumbersome weapon, and it was often as dangerous to the operator as to the target. The large fuel and air tanks, which comprised the gunner's pack, made him a special target for snipers and automatic weapons.

Following the war, research for a more modern and streamlined pack resulted in the evolution of a doughnut-shaped flame thrower having maximum volume and minimum bulk. Several models illustrating the development work during the transition period are on display.

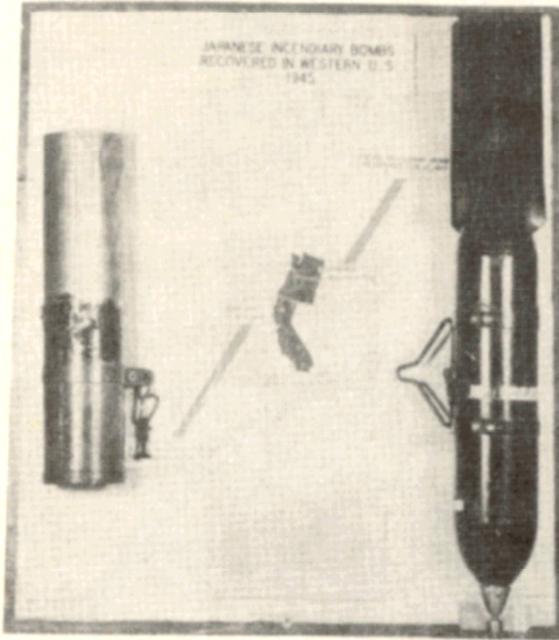




JAPANESE EQUIPMENT

JAPANESE EQUIPMENT

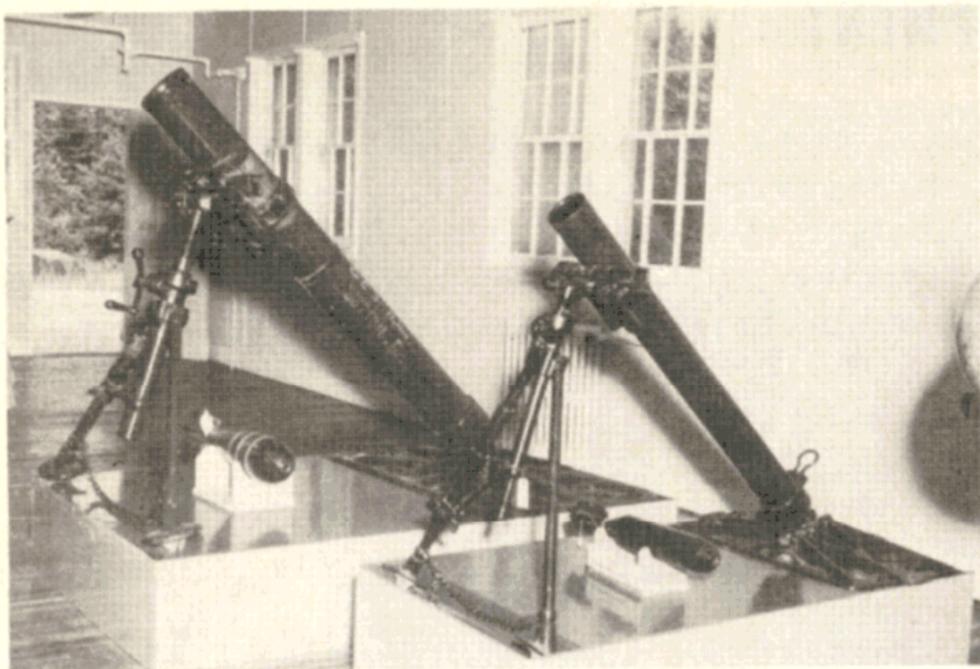
Incendiary and high explosive Japanese bombs of the type shown here were attached to silk or paper balloons and released in Japanese-held areas. Air currents propelled them over the United States and Canada. By July 1945, 280 of them had been sighted or recovered; less than 20 had functioned. Incidence ranged from Alaska to Arizona and as far east as Michigan.



A novel method of dispersal is this Japanese tracked vesicant sprayer. This vehicle was intended to be towed toward enemy positions as it sprayed a toxic agent. Development of large-caliber automatic weapons, however, made such a method of dispersal impracticable.



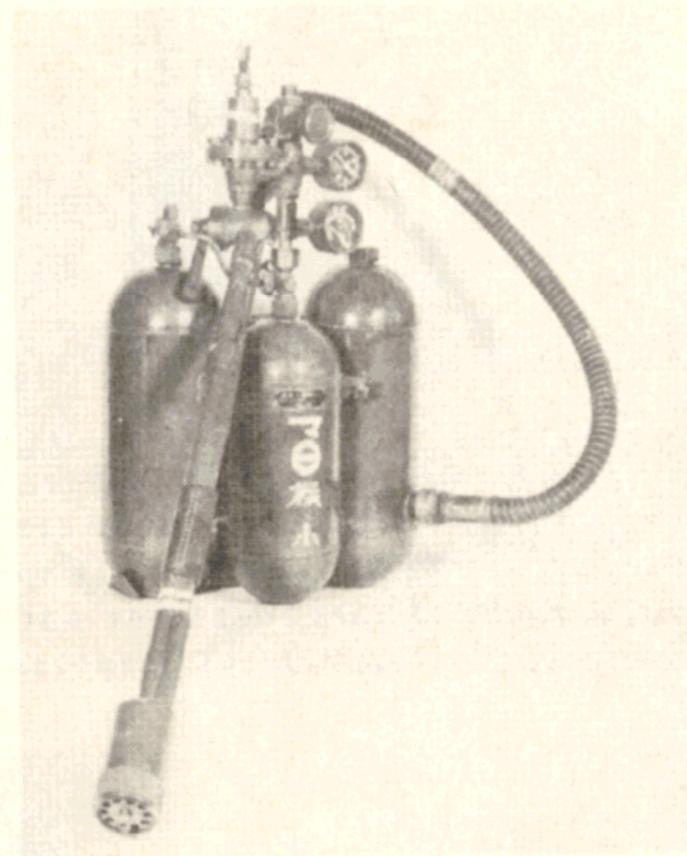
TRACKED VESICANT SPRAYER



JAPANESE MORTARS

Realizing the value of flamethrowers in close combat against fortified positions, the Japanese paid particular attention to this type of weapon. During World War II they had several models in the field, one of which is shown at right.

The Japanese also developed chemical shells designed to be projected by mortar. These mortars were similar in size and mode of operation to those of the Allied nations.



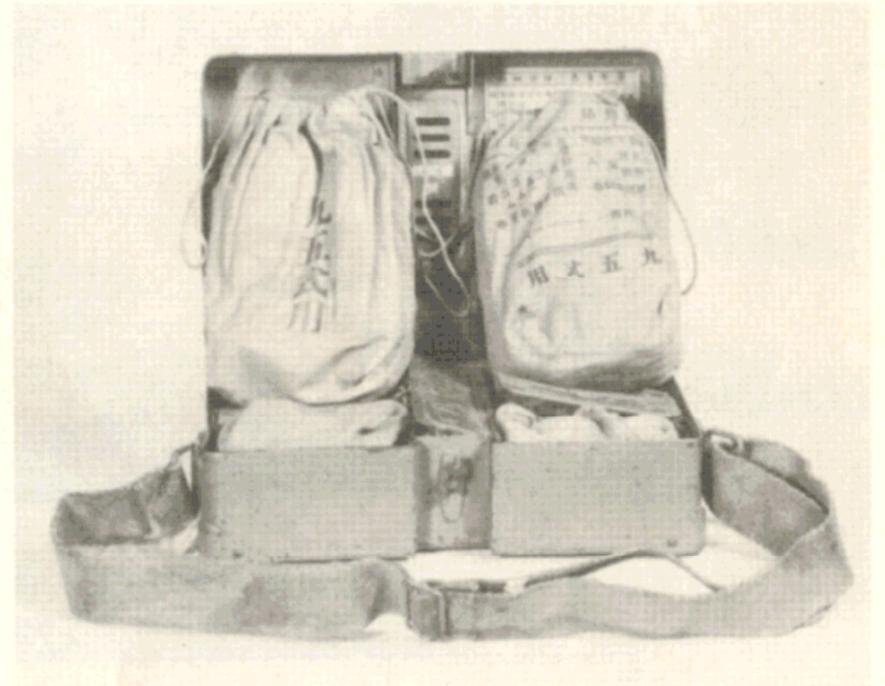
JAPANESE FLAME THROWER

A unique item displayed at the museum is the Japanese gas mask for cows. This mask was possibly intended for use in India if military plans of the Japanese had materialized.

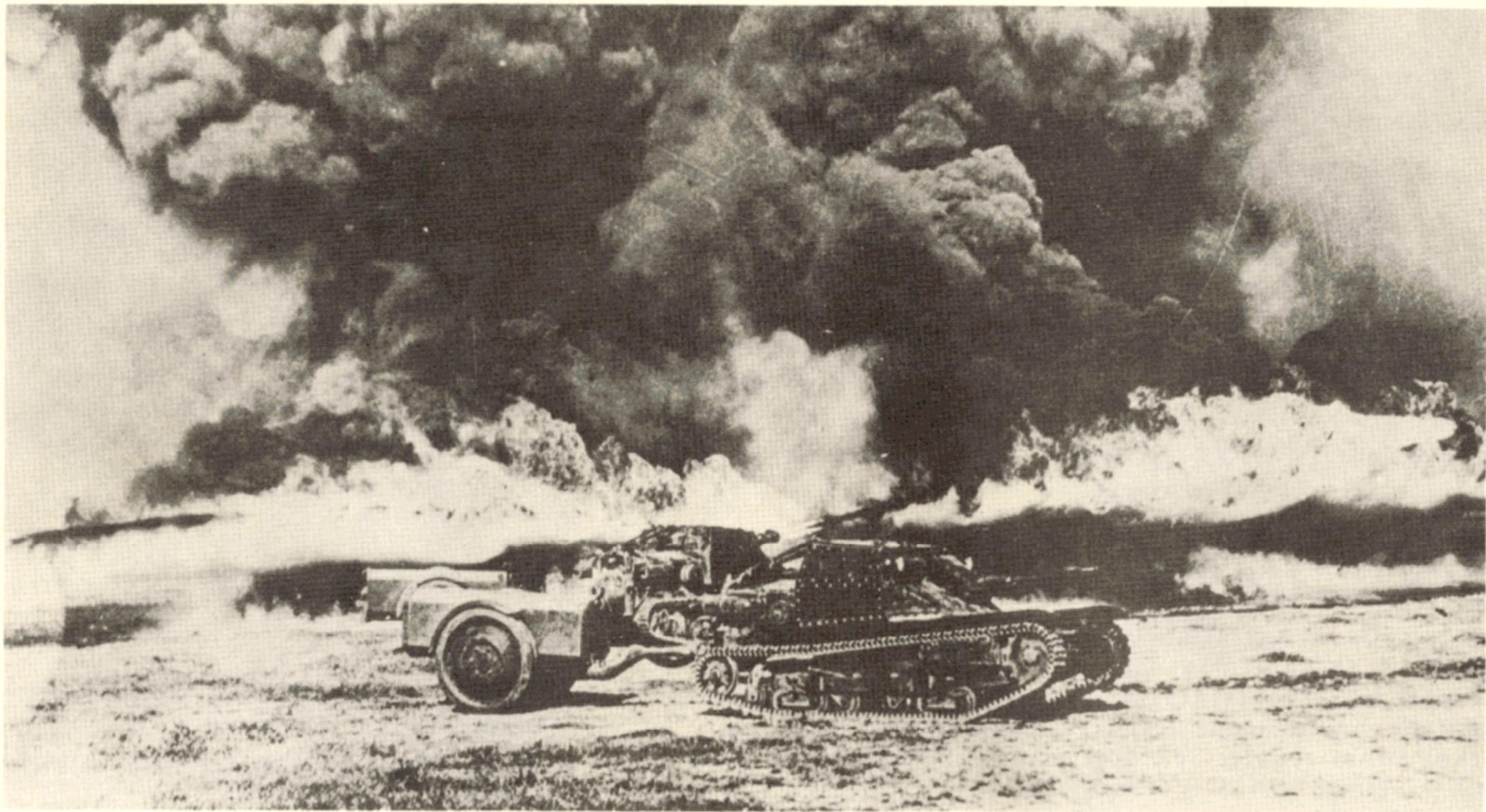


JAPANESE COW GAS MASK

Under the strenuous conditions of combat, gas masks may be damaged in field operations. Gas mask repair kits, containing needles, thread, and rubber patches, were made standard company equipment so that minor repairs could be made in the field.



JAPANESE GAS MASK REPAIR KIT



ITALIAN FLAME-THROWING TANKS

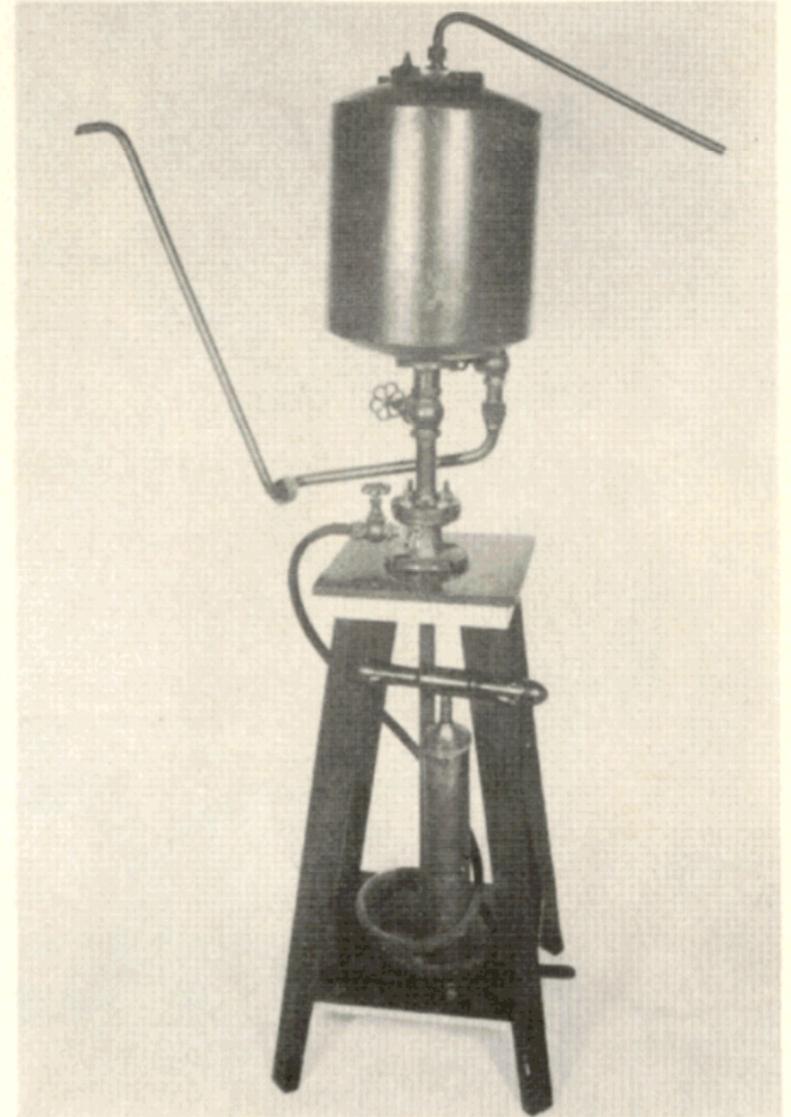
ITALIAN EQUIPMENT



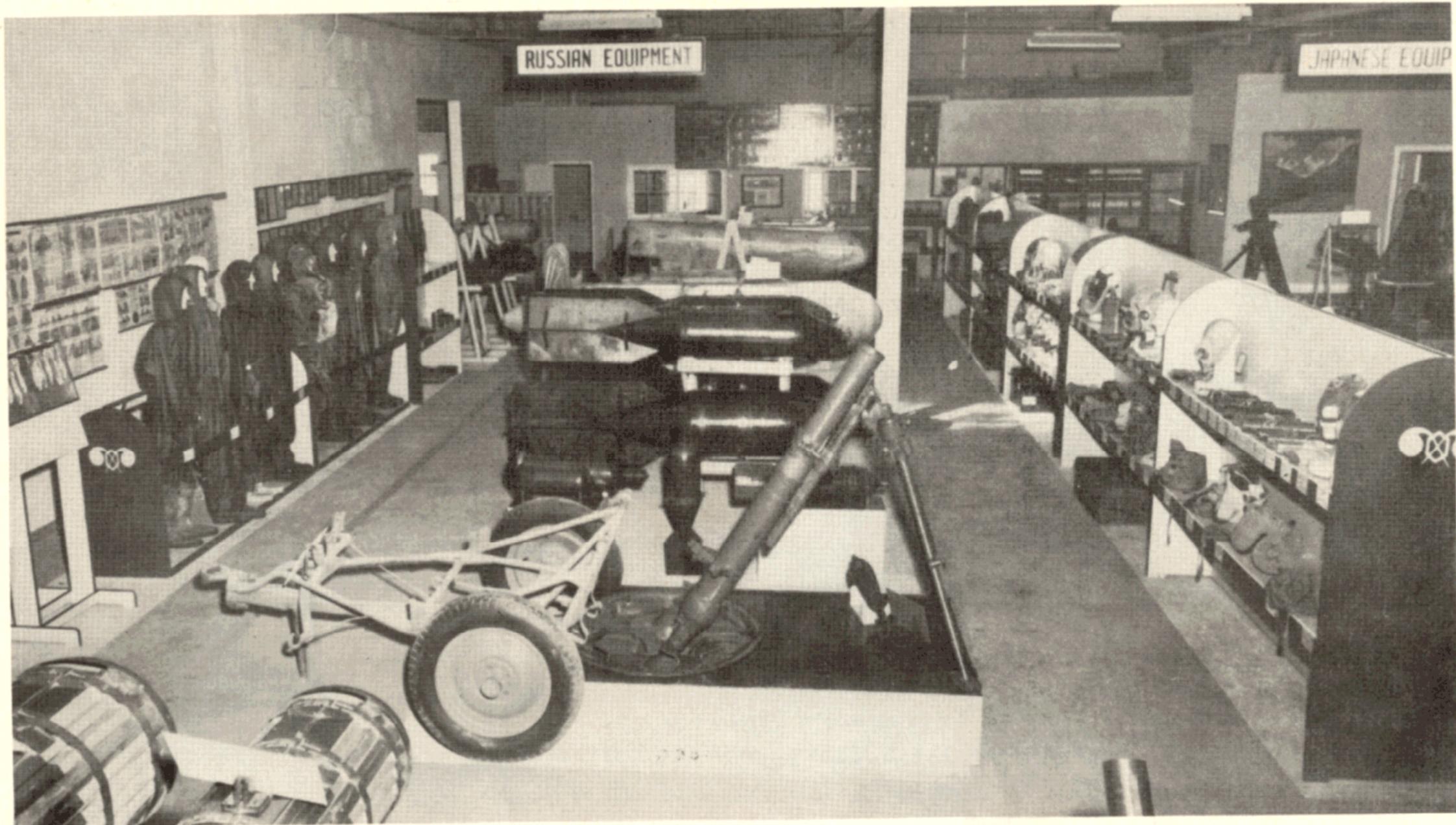
ITALIAN MASKS

The Italians were first introduced to modern gas warfare when the Germans used chlorpicrin on the Italian front in 1917. Understandably, their first masks were crude. However, by World War II they had an adequate mask which had been tested in Ethiopia.

The travasatore is a munitions filling and transfer unit. The liquid chemical agent is forced into the decanter from a bulk storage tank by means of air pressure supplied by the bicycle pump. The liquid is then transferred to spray tanks, bombs, or other munitions.



TRAVASATORE



SOVIET EQUIPMENT

SOVIET AND SATELLITE EQUIPMENT



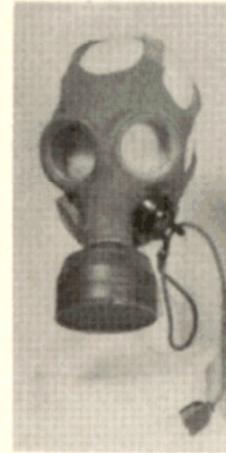
RUSSIAN PROTECTIVE
CLOTHING

Russia, also, was unprepared for gas warfare in 1915, and the first Russian masks were crudely improvised devices.

Prior to World War II, Czechoslovakia manufactured and supplied gas masks to most of the European Countries. Shown at the right is an example of the Czechoslovakian mask widely distributed through Europe during this period.

At the right, also, is an Estonian mask of World War II vintage equipped with a telephone connection.

Protective clothing is primarily intended for use by decontamination crews, personnel filling chemical munitions, and others whose duties may involve their being splashed with vesicants or other agents. Items of Russian protective clothing which are on exhibit at the museum are illustrated at the left.



ESTONIAN MASK



CZECH MASK



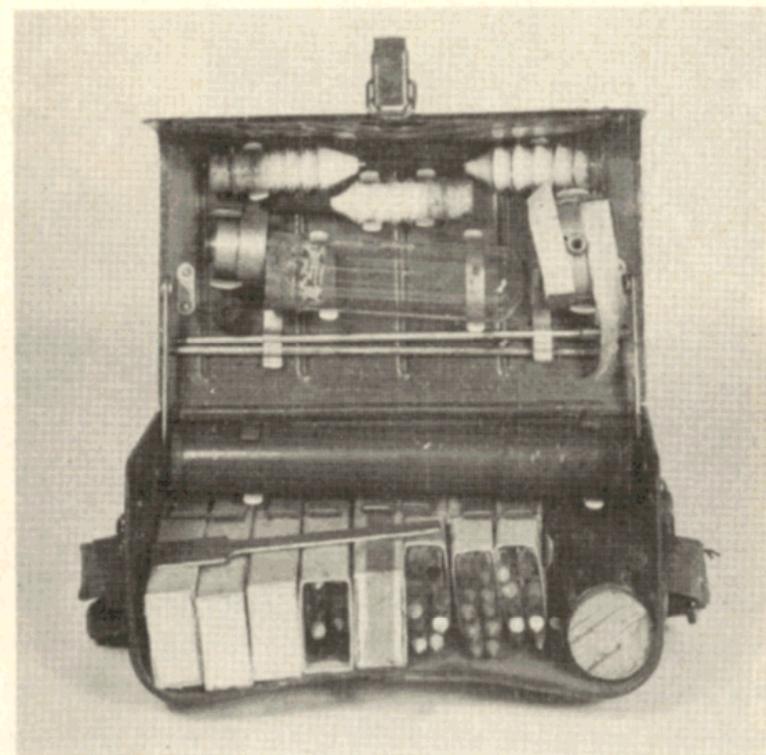
EARLY RUSSIAN MASKS



WOOD GAS PROTECTIVE
BOOTS

With the development of war gases, it soon became apparent that man could not safely depend on odor to warn him of the presence of gas. The Russian detector kit shown at the right is one version of equipment designed to detect the presence of gas scientifically. This kit contains gas-sensitive paper and crayons and sample collecting equipment.

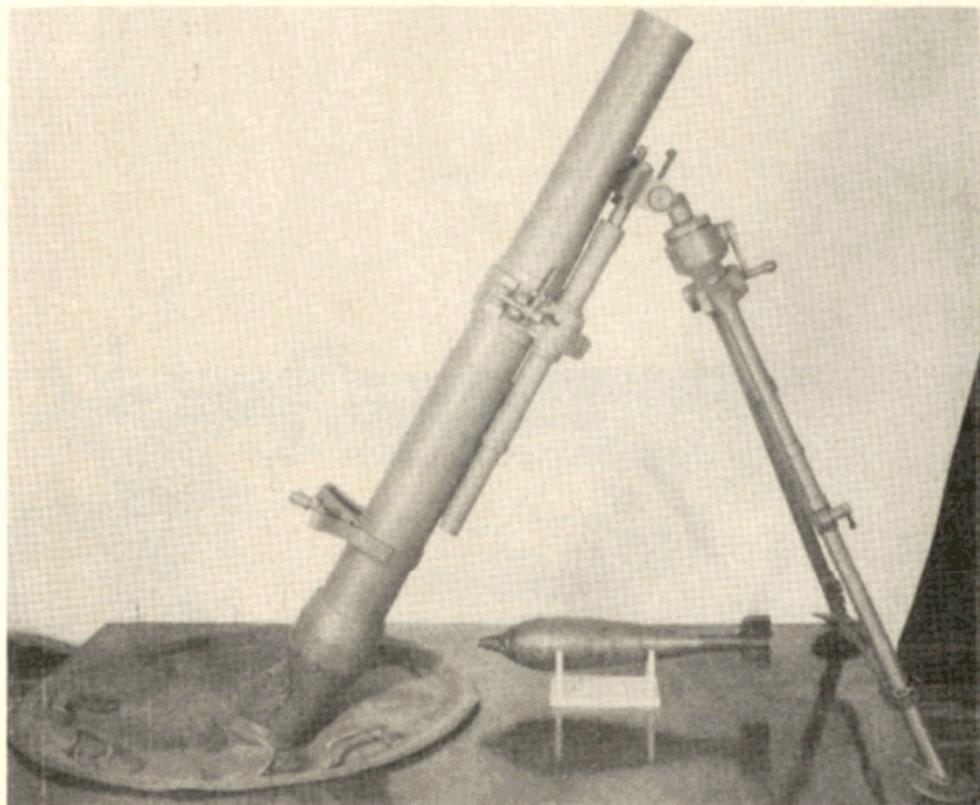
Because troops must sometimes advance across contaminated areas before decontamination measures have been taken, the various armies have developed protective footwear. Polish protective wood boots with cloth leggings are shown at the left. They are designed to protect the feet and legs of the wearer against toxic agents clinging to undergrowth.



RUSSIAN GAS DETECTOR KIT

ENEMY EQUIPMENT CAPTURED IN KOREA

Russian 120-millimeter mortar captured in Korea, in 1951.

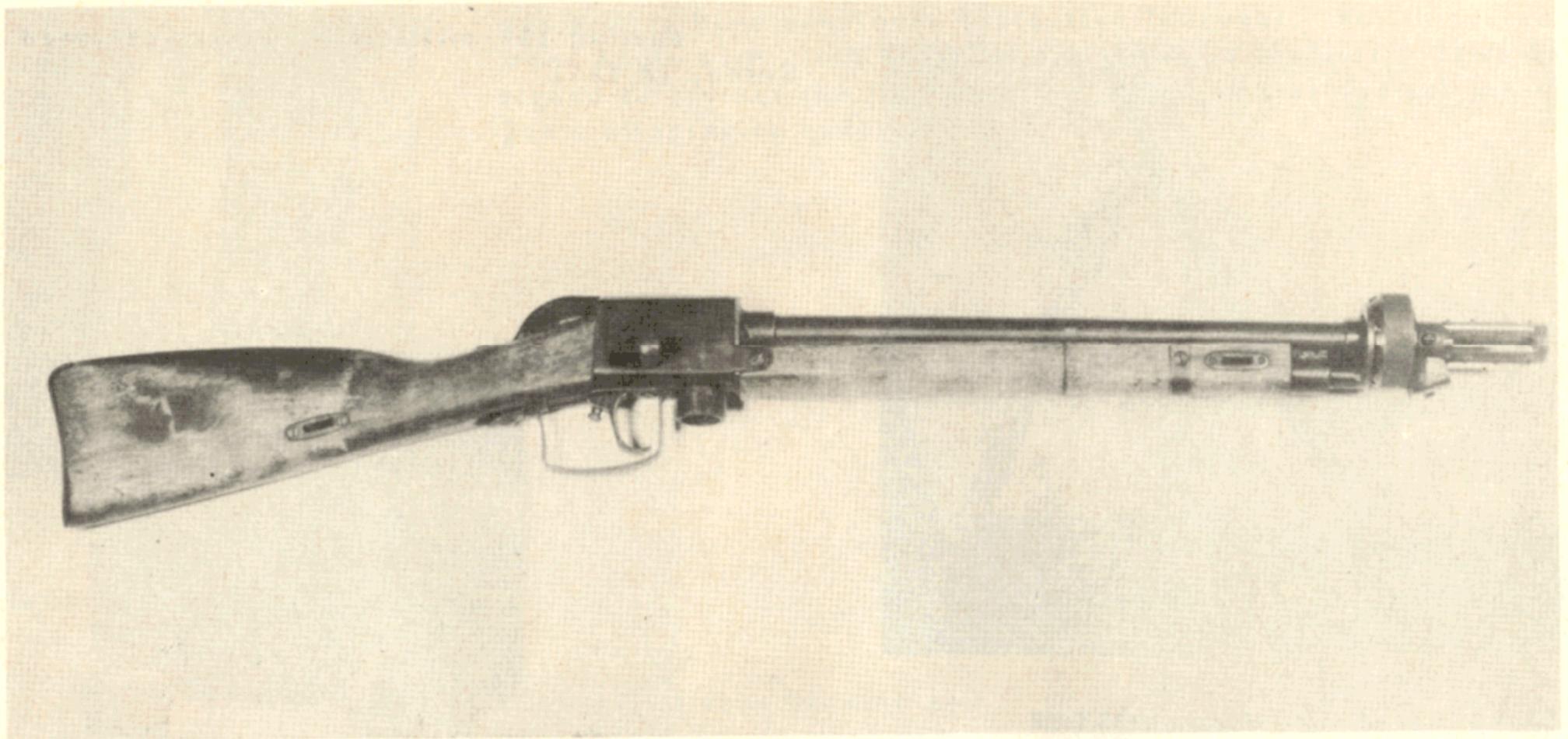


RUSSIAN 120-MM. MORTAR
(CAPTURED IN KOREA)

This smoke pot of Russian manufacture was found near Seoul, South Korea in 1950. The smoke produced is of a screening nature and is nonpoisonous.



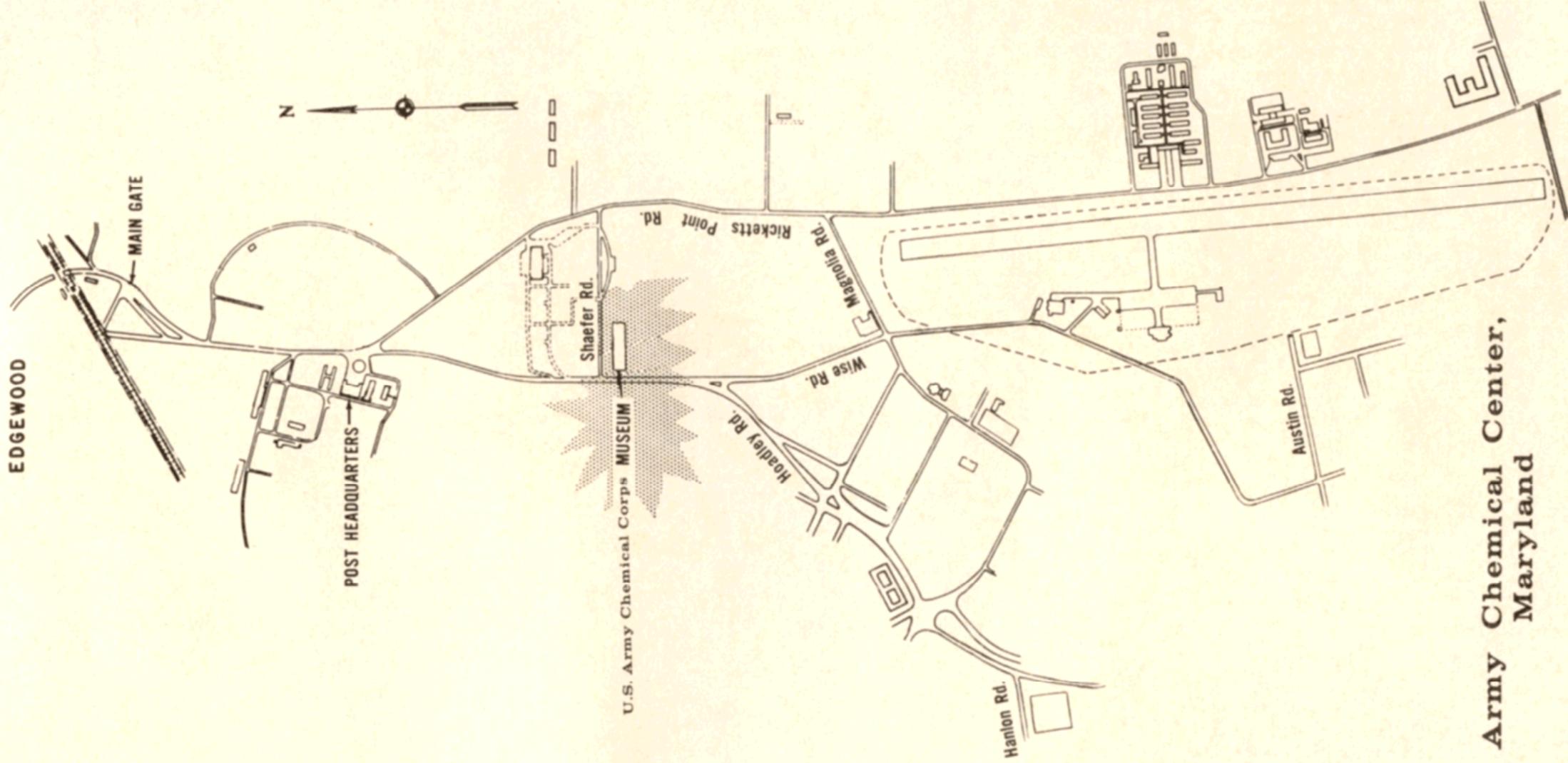
RUSSIAN SMOKE POT



FLAME THROWER GUN

This flame thrower gun, used against United Nations troops in Korea, closely resembles a conventional ordnance weapon.

EDGEWOOD



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Maryland

ARMY - A CML C, MD.