

**T**HE civilized world now, for nearly two years, has been completely surfeited by the horrors of warfare. Fortunately, the picture has another side. If this has been the most dreadful war in history, it has also been the most merciful. Science has found new ways to destroy, and has also found new ways to restore.

The last thirty years have been the age of Moltke and Krupp; it has likewise been the age of Pasteur, Lister, and Koch. While one class of inventors has been busy constructing submarines and floating mines and lyddite shells and asphyxiating gases, another class has been constructing plastic surgery, antiseptics, serums, sanitation, and vaccines. These two tendencies have met in the battle-fields of the present war.

This conflict, from whatever point of view we regard it, is different from any other ever known. The soldier who dies in this European war, dies, in almost every instance, from a wound inflicted by the enemy. He does not succumb to disease that arises in his own ranks. Bullets, shrapnel, explosive bombs, and fragments of hand grenades are the deadly weapons to-day. In former wars the microscopic germs of typhoid, of typhus, tetanus, cholera, plague, cerebro-spinal meningitis, and dysentery decimated armies.

#### Medical Triumphs of the War

**U**P to March, 1915, England had sent about 800,000 soldiers into the field. This enormous mass of men, living under inevitably distressing conditions in the closest physical association, had developed 650 cases of typhoid. That is about one in 1200, and indicates that one is less likely to contract typhoid in war than in peace. In the early days we heard of many cases of tetanus; this disease also has been conquered. The war has witnessed little malaria, or articular rheumatism, or pneumonia, or appendicitis—all ills that formerly almost inevitably dogged the soldier's footsteps.

There are few deaths from wounds, unless such deaths are instantaneous. Nowadays a bullet or a fragment of shell, in order to destroy, must hit a vital spot. If the stricken soldier crawls to some place where the surgeons can reach him, the chances overwhelmingly favor his recovery. On this point we have a few illuminating statistics. Up to November 30, 1914, the French *Service de Santé* had handled approximately 500,000 wounded, exclusive of those who had died on the battle-field. Of these 54.5 per cent. returned to the army within a short period; 24.5 per cent. received furloughs and

have since joined their commands. Of the rest, 17 per cent., at the time this report was made, were in hospital, with every indication of recovery. Only 2.48 per cent. had died of their wounds, and only 1.48 per cent. had been so disabled as to be unfit for further service. Of these 500,000 wounded men, therefore,—and this included the 112,000 wounded whom the French service had on their hands after the battle of the Marne,—96 per cent. were sufficiently repaired to be able to resume service in the field. This report covered the early months of the war, before the French had completely organized their hospital service. The absence of disease epidemics and the large percentage of men recovering from wounds, are thus the great medical triumphs of the war.

#### This War's Peculiar Problem

**T**HIS war, however, though it does not have its disease epidemics, still has its own peculiar problem. And here again it is different from any other ever fought. Not typhoid or tetanus or dysentery or cholera—these no longer terrify: the one prevailing horror now is wound infection.

A microorganism discovered several years ago by Dr. William H. Welch of Johns Hopkins, the *bacillus Welchii*, though it sometimes masquerades as the *bacillus Perfringens*, is the prevailing germ to-day. This bacillus, as much as 42-centimeter guns, submarines, and aeroplanes, is, in a sense, one of the great surprises of the war. Ages before Dr. Welch brought it to light, this destructive bacillus wrought havoc in the battle-field. It probably destroyed large numbers of Caesar's and Napoleon's soldiers. Never, however, has it found the favorable breeding-ground that this war has given it.

Here, again, the explanation is that this struggle, in its technique, is different from any hitherto known. In the first place, it is not, except incidentally, a rifle war, while in all previous conflicts the rifle was the chief engine of destruction. Now, a rifle-ball is the most comfortable form of injury in warfare. It usually makes a smooth, clean wound. If it pierces merely the soft parts, it goes in and out, destroying a blood-vessel, it may be, and so making work for the surgeon, but accomplishing little permanent harm. If it strikes a vital part, like the heart, it kills; if it splinters a bone, it produces unpleasant complications. But the ordinary rifle wound is seldom infected. A war in which rifle wounds play the major part, though not free from gangrenous calamities,—we had plenty in our Civil War,—does not present these as the chief surgical problems. But rifle wounds are not numerous in this war. The damage is done by exploding shells, bits of shrapnel, and bombs from hand grenades. These make ugly, jagged wounds. The shells themselves are covered with colonies of the blood-poisoning bacilli; they carry into the tissues bits of dirty clothing, presenting a splendid field for growing the Welch organism. So the wounds in this war present a new feature, in that they are all infected.

The other circumstance that makes this condition inevitable is that this war is a subterranean one. The whole battle line is a huge rabbit warren, in which armies burrow several feet deep. The particular part of France that has been cultivated and fertilized for centuries is precisely the soil in which these destructive microorganisms most successfully flourish. The trenches are thus culture tubes

on a stupendous scale. The bodies of the soldiers, their clothes, their weapons, everything is swarming with them. Once an open wound is made, it immediately becomes infected.

The first surgical problem is rapidity in transporting the wounded. Under old-time conditions the infecting process would have gone so far that only the most vigorous measures, such as amputation, could have saved life. In spite of current newspaper stories, amputations have not been numerous in this war, for the automobile has saved many a leg or arm. If the surgeon can get the wounded man within twelve hours, he can usually stop the infection.

The second problem is the development of an antiseptic that will destroy this infecting process. And here again this war has developed a paradox. The life-savers have had to push surgery back thirty years; for they have had to discard a practice—that of asepsis—which they have long regarded as the crowning glory of their art. The day of antiseptics has returned. Antiseptics, as developed by the great Lister, was the process of sterilizing surgical wounds. An assistant sprayed the incision with carbolic acid or some other disinfectant, the idea being to destroy the organisms introduced as the operation proceeded. This was a wonderful discovery, the beginning of modern surgery; but, as time went on, asepsis took its place.

In brief, antiseptics destroyed the organisms of blood-poisoning: asepsis provided that there should be no organisms to destroy. The sterilization of instruments, of the surgeon's hands and garments, of the operative surface, the use of sterile gauze and bandages—all this was part of the beautiful new aseptic technique. But this war has blown it all to the winds; for the wounds, as already said, are infected when the surgeon gets his patient. So he has had to go back practically to the original procedure of Lister.

#### "Places of Refuge"

**S**ANITATION in the trenches has reached a degree unexampled in previous wars. All garbage and refuse is burned as systematically as in a well ordered American town—more systematically than in many. The French soldiers have no alcoholic drinks except the lightest of French wines. Here again the main object is to discourage wound infection, since a body weakened by alcohol has a lowered resistance to microorganisms. Good drinking water, always thoroughly sterilized, is constantly at hand. Even the men in the trenches have frequent baths;



## The Surgery of the War

By BURTON J. HENDRICK