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THE COTTON THAT KILLS; HOW IT IS MANUFACTURED

Transformation of Innocent Product of Peaceful Use into Terrible Lethal Agent Upon Which All Nations at War Must Depend. Why It is Contraband.

(W. C. Fitzgerald in London "War Budget.")

Surely the strangest perversion of human genius is that which turns food and clothing into terrific explosives for the shattering and maiming of men. Four ships whose fate was argued in the prize court recently contained 9,000,000 lbs. of lard. It was contended that the Germans now made glycerine from this innocent stuff, and of course, glycerine is on the list of "ingredients of explosives," and so is absolute contraband of war.

From the harmless useful coal comes benzole, from this in turn is obtained trinitrotoluene, which yields our enemy his most powerful explosive—the dread "T.N.T."—used in German shells, mines, torpedoes, and aerial bombs. Then Scotch distillers, we hear, are decidedly short on their spirit allocations, owing to urgent needs of the government in connection with high explosive manufacture. Carboric acid, too, with which the surgeon cures, is also a killing agent in the war chemist's hands.

But by far the most remarkable instance of this kind is cotton—the cotton of our shirts and collars, of our summer frocks and a thousand civilized needs. Cotton is America's greatest crop, employing 25,000,000 people. Ten million bales, each of 400 lbs., are exported. Here is the world's prime need. In the United Kingdom alone are 55,000,000 spindles supplying the universe with piece goods.

Five 5,000 Bales a Day
The Hindu's turban in Manchester made; the Chinese coolie's blouse, and the loin-cloth of the African savage. Yet, strange to say, cotton also means high-explosive shells. Every weapon, great and small, from the rifle to the giant howitzer, uses nitrated cotton as a propellant. The terrific bombardments of the Austro-German "phalanx" use up cotton by the ton. Our foes are creditably reported to be firing off 5,000 bales a day in desperate endeavor to dynamite their way to victory before the Allied Powers can extend their own resources.

We know that on the Danube they used 700,000 shells in three hours, concentrating 2,000 siege guns, and literally blowing away \$2,500,000. Again, in four hours the enemy fired as much high explosive shell against the fortress of Przemyśl as the Russian experts would have thought sufficient for a six months' siege.

But it pays, as the French found near Arras, where one day's bombardment cost them \$1,625,000, and won points of the highest tactical importance. Observe how the world's treasure melts in this earth-rending din. I repeat, it takes cotton to throw every bullet and every shell by land and sea. Hence all the political stir about cotton as "absolute contraband of war."

Absolute Contraband Now
It was a delicate and perplexing question. "We have to be very careful," the prime minister explained, "in the exercise of our belligerent rights, not to impinge upon the trade interests of neutral powers with whom we are on terms of perfect amity." At the same time Mr. Asquith said he was "not satisfied." A great deal of this material and necessary ingredient did reach the enemy, and the problem was receiving "watchful consideration" by the government.

But this cotton is now absolute contraband, and German chemists are hard put to it to devise substitutes—wood pulp, for instance, purified with acids, and nettle fibre which was once largely used as a textile material. So the stoppage of cotton is a serious thing. Despite our blockade Germany got huge supplies from neutral ports. Import figures show that since the war began Sweden has taken 29 times her normal allowance, Denmark 35 times, Holland 15, and Norway 18.

All this surplus cotton has gone to Germany to deal death and destruction upon us. The 15 in. naval rifle, such as the Queen Elizabeth carries, fires a whole bale of cotton at each discharge; the same weight (400 lbs.) would make cordite for 80,000 rounds of rifle ammunition. Now for explanation.

Invention of Gun Cotton
As guns by land and sea increase in size and power, the old black powder grew more and more unsatisfactory. It burned too quickly, and put too great a strain upon the

"T.N.T." have made the mightiest fortress of no avail. Witness the fate of Moubouge and Liege, Namur and Antwerp, Kovno and Novo Georgievsk.

It is the high explosive that shatters trenches and buries men alive in them. It is the high explosive that "searches" a position, whether by shell, bomb, or aerial mine. But the stuff is not used in the gun. Its awful work begins when it "gets there," so to speak. And the propulsive agent—the powder that throws the shell—is a nitro-cellulose compound, of which over 60 per cent is pure cotton. To make a million shells such as Germany shot off in a single day would need a whole ship-load of cotton, or about 1,750 tons.

"Life and Death"
No wonder our famous chemist, Sir William Ramsay, declares: "It is a matter of life and death for us that there shall be no further re-exportation of cotton to Germany." Sir William scouts the idea of substitutes. Other experts picture the enemy calling up shirts and sheets, towels and handkerchiefs, surely an odd contribution to the world-war, following the call upon gold ornaments for treasure, and copper pots for the bands of shells.

A cotton famine, then, menaces our foe as nothing else can do. He's now experimenting with dried elder pith, hemp, and straw and wood fiber. "I declare as a chemist," says Sir William Ramsay, "that this is impossible." "If the Germans are driven to using woody fibres, their resulting explosive will not propel the shell or bullet so far. If they want equal power they will need a larger charge, and so will have to enlarge the barrel of every gun and rifle. On the other hand, if they are content with lower power, they will have to alter all the rifle and artillery sights. Both operations would be absurd during the war."

As for making the explosive from manufactured cotton goods, this could be done; but the powder resulting would be far less effective than that made from raw cotton, pure and clean and of fine quality. Moreover, special factories and plant would have to be erected for tearing up the fabrics. It is a fascinating dilemma.

Making of Gun-Cotton
Powder made without cotton at all is ten times less powerful than our own cordite, which is made from gun-cotton. All the nitro-cellulose (cotton) powders require extraordinary care—care in blending the cotton-waste, care in steeping to secure uniformity in acid saturation, and the greatest care in storage. Our own cordite is kept refrigerated to a safe temperature in the magazines of our warships. On the whole it is the most stable of all the nitro-cellulose compounds, whether for the plains of India or the intense cold of Canada.

The early story of all cotton powders is marked with terrible disasters, due to mysterious decomposition of the stuff. At Waltham Abbey or Stowmarket you may see girls picking over the innocent, fluffy cotton-waste to remove all foreign matter—a scrap of wood or string or cardboard. Then tearing machines take the cotton and open out lumps and knots, so that the acid bath shall have perfect access. It is then dried, and afterwards cooled in airtight iron cases.

These are now taken to the dipping house, where the cotton is carefully weighed into small lots and transferred to the mixed acids, of which it absorbs ten times its own weight. Excess of acid is squeezed out, and the cotton put in a pot and placed in the steeping pits, where it stays twenty-four hours in a low temperature, maintained by a stream of cold water. It is already nitro-cellulose, the basis of all propellant powders.

Next comes washing, wringing, boiling and beating. Finally the pulp is run down wood shoots provided with grit traps and electro-magnets, which catch the smallest particle of iron, sand, or other impurity. Lastly the stuff is blended and kneaded into cakes and discs for torpedoes, mines, bombs, or shells. As an explosive, 40 lbs of gun-cotton equals 200 lbs. of the most powerful black powder.

Cordite, the famous British propellant, is based upon gun-cotton (65 per cent) mixed with nitro-glycerine (30 per cent), and a little mineral jelly (vaseline, 5 per cent). Fired in a big gun it gives an intensely orange or scarlet flash, and a dense cloud of smoke which instantly disperses. For powder, reliability, and minimum wear and tear in the rifling, this powder is the best in the world. A yellowish ropey stuff, it is wound upon reels, as if to remind us of its cotton origin—the cotton that clothes as well as kills.

Truly explosives go in innocent guise. Thus picric acid is a cure for burns. It is also the main ingredient of lyddite, the terrific agent in our high-explosive shells. Without nitrogen there could be no explosive at all. Yet this inert gas is the chief constituent in the very air we breathe.

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