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TABLE OF CONTENTS OF
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SCIENCE AND COMMERCE AS PEACEMAKERS.

There are two and only two great interests which, in the progress of mankind toward civilization, have proved themselves to be overwhelmingly on the side of peace, namely, Commerce and Science. And to the development of these we must look for the final suspension of warfare, if the reign of universal peace shall ever dawn upon earth. It is true that religion claims to be a peacemaker also—the great peacemaker; but history shows it to be rather a stirrer up of strife. It is not until men cease to regard religion as the first of human interests, not until they become comparatively indifferent toward it indeed, that they cease to fight about it.

The influence of commerce as a preventive of war is more direct and tangible. To the commercial mind the leading question touching any course of action is, Will it pay? And the experience of mankind is, on the whole, that, commercially considered, war does not pay. Particularly is this true when the commercial relations of the contestants are at all close. Besides, commerce makes for peace by multiplying channels of friendly intercourse, by removing national prejudices, and by increasing the mutual interdependence of nations.

The peace promoting influence of commerce can be clearly seen in the recent history of the relations of this country with England. We have had disputes in abundance, and, according to non-commercial standards, plenty of occasions for an appeal to arms. But our commercial relations have been so intimate and extensive that we could not afford to go to war; consequently our difficulties have been honorably settled by arbitration or other peaceful means.

It is equally clear that the commercial interests of England have been the chief restraining force in that country during the recent oriental trouble. Both the ruling class and the rabble have been eager for war; but the prudent, practical, commercial element has carried the day for peace. And we may set it down as an axiom in social science that as the commercial intercourse and mutual dependence of nations increase, their disposition to go to war with each other will decrease. With such nations the prosperity of the people outweighs dynastic pride or imperial ambition. The people say, "War will not pay: let us have none of it;" and more and more in the world the will of the people rules.

As the great ally and mainspring of commerce, science plays an important role as national peacemaker; but its chief influence comes through its service in making war more and more terrible and destructive, on the one hand, and, on the other, in making it less and less a matter of individual heroism and brute force. It is a common remark that the history of military art is simply the record of inventions for enabling men to kill each other with ever increasing ease and swiftness. And the latest inventions have been most marvelous in their capacity for killing. There is small chance for personal glory on the battlefield now; and every new invention only helps to reduce battles more and more to the level of the shambles. The question is, Will not this line of progress soon end in making war too horrible to be tolerated? It must be apparent before long that no end attainable through fighting can be worth the sacrifices necessary to gain it through or in spite of such destructive agencies.

Besides, may it not be possible for inventors to contrive engines of destruction, so awful in their scope and so irresistible in their power, that the mere assembling of masses of men for offensive purposes may be made too hazardous to be attempted?—engines by means of which a city or an army, however protected by fortifications, may be destroyed without possibility of escape?

We have seen of late years how one branch of warfare has been practically suspended by the progress of invention. In their desire to compete with the naval power of England the governments of Europe have for the past quarter century put forth their strongest efforts to bring the science of offensive and defensive naval construction to perfection; and England's counter efforts to maintain the supremacy of her fleet have called out the utmost energies of her inventors and builders. Yet the result seems to be to make a great naval battle no longer a possibility. During the Franco-German war the second best navy in the world could do nothing. During the war just ended the splendid fleet of Turkey, officered by Englishmen, has been little better than useless. And with all our joy at the termination of that conflict, we cannot repress a shadowy regret that no opportunity was offered to remove the uncertainty as to whether the English ships could have got out of the Sea of Marmora if any one had chosen to stop them. It might be worth a small war to have the status of iron clads definitely determined. As things stand their utility is wholly a matter of conjecture.

So much for invention in naval warfare. The torpedo has been the great peacemaker. And it is quite possible that the torpedo system may ultimately perform the same war restraining office on land. Surely science and ingenuity are capable of creating an aërial torpedo boat as efficient as the water torpedoes are. And then, who will dare go to war? Let us imagine an aërial torpedo carrier that could be navigated by electricity from the ground or from another air ship kept beyond the reach of destructive missiles; a deadly machine that could be made to hover over an attacking army or a beleaguered town and rain upon it explosive shells of the most destructive sort. Against a fleet of such engines, what city could stand, what fleet or army could gather for offensive purposes? All the usual machinery of war would be useless, and war as we understand it would be impossible. As the sea torpedo has made an end of naval battles, so the air torpedo would put a stop to battles on land. And just as, through increasing civilization, men are learning more and more to put their trust, not on personal prowess or elaborate armament, for the settlement of their personal disputes, but in courts of law, so nations must learn to submit their quarrels to international courts of arbitration. In perfecting firearms, science put an end to individual dueling. In like manner, by perfecting means of wholesale killing, science is likely to put an end to national dueling. The most efficient agent of the (unorganized) Universal Peace Society of the future will be he who shall invent the best aërial torpedo carrier.

THE UTILIZATION OF WASTE MATTERS.

The strict economy of Nature, which never allows a particle of matter to be either wasted or lost, is so manifest that it could scarcely have escaped the attention of man; and so, when circumstances compel him, it is not surprising to see him putting in practice the lesson she has taught him, and striving to put every scrap to the best account. In China, owing to the crowded state of the population, this economical husbanding of material has, of necessity, long been in vogue; and to such an extent is it carried that what would be considered strict economy in Europe or America, would there be regarded as absolute waste. The same causes have been slowly operating to bring about a similar state of things in Europe. Thousands of materials that were but a few years ago thrown away as utterly useless are now carefully saved and turned to some account either for purposes of luxury or necessity. Hosts of costly products of distant climes can now be procured at home, at an insignificant expense, from the most unpromising sources. For instance, Science has evoked the most delightful perfumes from the most offensive refuse, and extracted dyes of the most gorgeous hues from a most unlikely looking material—pitchy-black tar. Accidental discoveries, no less than active researches, are continually transforming some article comparatively worthless into something else that stands high in commercial estimation, and supplementary factories are gradually springing up to utilize the by-products of others. So numerous are the discoveries that something useless may be converted into something useful, and so rapidly does one follow in the wake of another that it is difficult to keep pace with them. Scarcely a scientific exchange reaches us that does not contain the announcement of some such fact, and the details of the process by which the result may be reached. Here, for example, before us, in the current number of the *Echo Industriel*, we have a description of the method by which the straw is extracted from manure heaps to be subsequently utilized (after cleaning and drying) as a cheap bedding for horses and cattle, packing for glass, crockery, etc., but more especially for making paper pulp, to which it is said to be peculiarly adapted; since, saturated with urine and allowed to ferment, ammonia is evolved, which aids in separating the fibers, and reduces the need of using stronger and costlier alkalies to a minimum. After extracting the straw the remaining manure is sold for the usual purposes. The simple machinery for doing all this is the invention of an American resident of Paris. Much of the false hair worn by the fair sex of Europe and America is derived from sources that would make the wearers stand aghast were they to learn the facts. From a late report on the commerce of Swatow (China) we learn that a large export trade in hair, gathered in the stalls of barbers, sprang up in 1873, during which year 141 piculs (18,800 pounds) worth 2,904 taels ($4,300), were shipped to Europe. In 1875 the exports of this refuse arose to 1,000 piculs, with a value of over $25,000, certainly a remarkable industry to be created at such a distant point to supply the demands of a caprice of fashion.

To chemistry modern perfumery is perhaps more indebted than any art that ministers to the luxury of life. It is commonly supposed that all floral essences are the product of distillation; nothing could be a greater mistake; nearly every perfume of the toilet bottle or sachet of the mouchoir case is the product of waste matters—some of them odorless, others most intensely nauseous and disgusting. "Many a fair maiden damps her brow with the "Extract of Millefleurs," innocent of the knowledge that its essential ingredient is derived from the drainage of the cow-house! The perfumed toilet soap is scented, and confectionery flavored, with oil of bitter almonds artificially prepared by the action of nitric acid on the fetid oil of gas-tar. The pure "fruit sirups" of some of the soda water venders are made from factitious oils that chemists have learned how to produce. Singularly enough, too, the latter are usually derived from substances of disgusting odor. The oil of pine-apples is obtained from a product of the action of putrid cheese on sugar, or by making a soap with butter and distilling it with alcohol and sulphuric acid. The peculiarly fetid substance called "fusel oil" serves as a base for several artificial flavors; thus, distilled with sulphuric acid and acetate of potash it gives oil of pears; with sulphuric acid and bichromate of potash the product is oil of apples. And so, too, by other means known to the chemist, refuse corks are made to yield essence of mulberries, tallow to put forth essence of melons, and the wood of the willow tree to part with oil of wintergreen indistinguishable from the genuine article." The fact, well known to the schoolboy, that by the action of sulphuric acid on starch, sawdust, woody fiber, etc., a sac-