

of 1% of its mass. This might be stepped up by the "conceivable" future discovery of totally different methods for converting matter into energy. On this point the committee warned:

"Should a scheme be devised for converting to energy even as much as a few per cent of the matter of some common material, civilization would have the means to commit suicide at will."

Science News Letter, August 18 1945

PHYSICS

New Responsibilities

If we are on the verge of an Atomic Age, in industry and in war, it is bound to be an age of federated powers, bound together by common necessity and purpose.

By FRANK THONE

► LYING on the wide stone balustrades that flank the entrances to the State Department building in Washington are some 18th-century bronze cannon. Similar pieces may be seen in some state capitols and in museums. Beautifully wrought, they are works of art as well as ordnance. They are trophies taken from old Spanish forts in Cuba, and they bear an arrogant motto in Latin: "Ultimo Ratio Regum—The Final Argument of Kings."

These monuments of the Age of Gunpowder, the twilight of which may even now be coming upon us, archaic though they are, may still have a modern lesson to teach. Gunpowder, we have often been told, spelled the end of the feudal period, in which every earl and baron was a little monarch in his own right, and the beginning of the modern state because armored knights could not stand up against their overwhelming blasts.

That is not strictly accurate. Armored knights were doomed in the field about the time gunpowder came in, but it was not primarily by cannon. The archers of Agincourt, with their strictly medieval longbows, had shown that the unarmored man on foot could defeat the armored man on horseback.

But the knight could retire behind the walls of his castle, where arrows could annoy him but not undo him. Here is where the cannon came in. Even the most primitive tubes, hurling stone balls instead of steel projectiles, could batter down the oaken gates or breach the stone walls for the final storming.

Cannon were costly, and the hire of cannoners was high, so that only kings could afford to maintain one of these new-fangled siege trains. The resources of a baron, or even of a mighty earl, just wouldn't stretch that far. So the independence of the nobles went out in clouds of smoke from the "villainous

saltpeter," and the modern state, typified at first by monarchy, rode in over the castle ruins.

What has all this medieval history to do with today—the day of the atomic bomb?

A great deal. Recall the bill for the production of the first atomic bomb: two billion dollars. And the pooling of the best scientific brains in two great world powers to think the thing out—not forgetting the rich free gifts we got from the enemy in the shape of eminent exiles. And the building of whole new cities to put it together. And the marshalling of the world's greatest fleets of aircraft and warships to bring it to the threshold of the doomed enemy.

No small power, no matter how intelligent or industrious or heroic its people, could have brought to a focus such a mass of material and intellectual resources as was needed to produce this weapon. No Denmark, no Belgium, no Switzerland could have managed the job: superb though such nations may be qualitatively, they are insufficient quantitatively.

If we are on the verge of an Atomic Age, in industry as well as in war, it seems bound to be an age of great powers—or of federated powers, bound together by a common necessity and a common purpose. If cannon were the final argument of kings, atomic power is the last word of great powers. This has apparently already happened without our realizing it in the case of the United States and the British Commonwealth. Whether we fancy it or not, these two great composite powers are now welded by a ring not of gold but of uranium.

What of the powers outside this ring? Well, were we fascists at heart, we know what would be their fate—or if we don't realize it yet we shall see it presently written in the ruins of Japanese cities. The USSR and China might even-

tually be situated to oppose us with equally dreadful weapons—they have, potentially at least, the numbers, brains and perhaps the necessary mineral resources to bring on what would undoubtedly be the world's Ragnarok. And they might pick up stray Nazified scientists to help them, if they should come to hate and envy us.

But it would seem the better part of sanity, to look and hope for a turning of all the powers, great as well as small, along the road of peace made possible at last by an abundance of power for all.

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