Hitting the Moon with a Rocket

Professor Goddard of Clark College plans to fire off a cracker right under the nose of the man in the moon

By E. F. Richards

A FEW months ago the plausibility of reaching the moon was considered in these pages on the basis of some calculations made by the French aeronautical engineer Robert Esnault-Pelterie, who showed that the most compact explosive known did not carry within itself sufficient energy to convey it to the moon by its own power.

Now Professor Goddard of Clark College, Worcester, Mass., comes forward with computations and experiments that cast an entirely new light upon the situation. In the first place, it is to be observed that, in order to reach the moon, it is not necessary that the explosive employed should possess sufficient energy to carry the whole of its weight to our satellite. For, as a rocket proceeds on its course, it continually discharges a part of its mass, so that only a fraction is carried the whole distance.

Secondly,—and this is where the significance of the recent computations and experiments appears,—it has been found by calculation that the velocity of the gases issuing from the rocket, by which velocity the kick is produced, has an extraordinarily great influence upon the amount of explosive required. Professor Goddard has succeeded, in his experiments, in raising the velocity of the gases discharged by the rocket from 1,000 feet a second, the best performance of ships' rockets now on the market, to 7,000 feet a second. The best rifle hurls its bullet out of the barrel with an initial velocity of less than 3,000 feet a second.

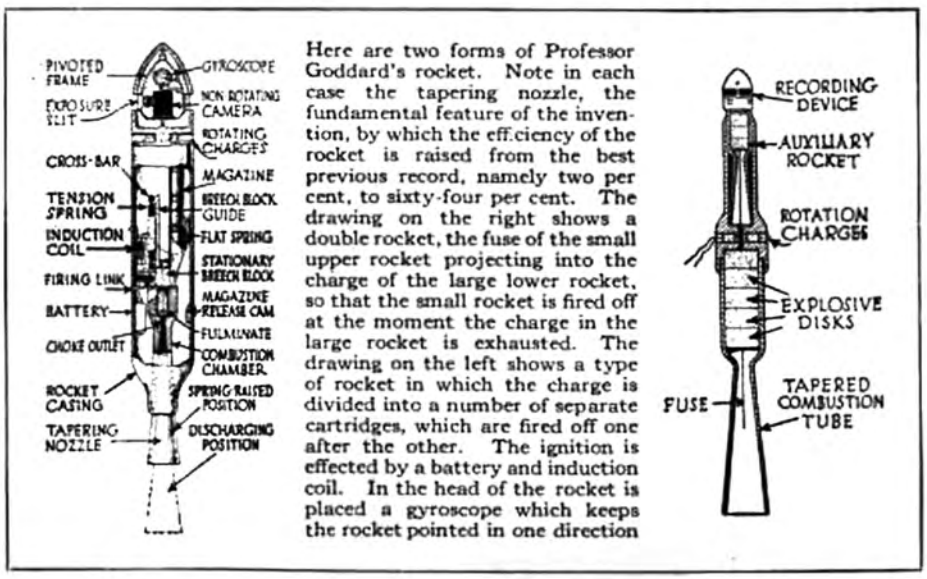
The full significance of this can be appreciated only when we consider some actual figures. So, for example, Professor Goddard's computations show that in order to kick one pound from the earth to the moon requires, under the most favorable circumstances, an explosive charge of 602 pounds. This is assuming a velocity of 7,000 feet a second for the gases discharged by the rocket. But if we were restricted to a velocity of 1,000 feet a second, as in the ships' rocket, the charge required, per pound carried to the moon, would be the seventh power of 602—that is to say, 14,290 million million tons!

It will thus be seen that Professor Goddard's improvement in the design of the sky-rocket has, at a single step, transferred the enterprise of hurling a missile to the moon from the class of utterly impractical dreams to the domain of entirely feasible and even comparatively light tasks.

The principal feature of Professor Goddard's improved type of sky-rocket is the tapering nozzle, designed on the principle of the turbine nozzle, so as to utilize the work of expansion of the hot gases. This design has increased the efficiency of the rocket from two per cent, the best performance attained hitherto by any rocket, to sixty-four per cent, exceeding by far the record of even the very best of internal-combustion engines.

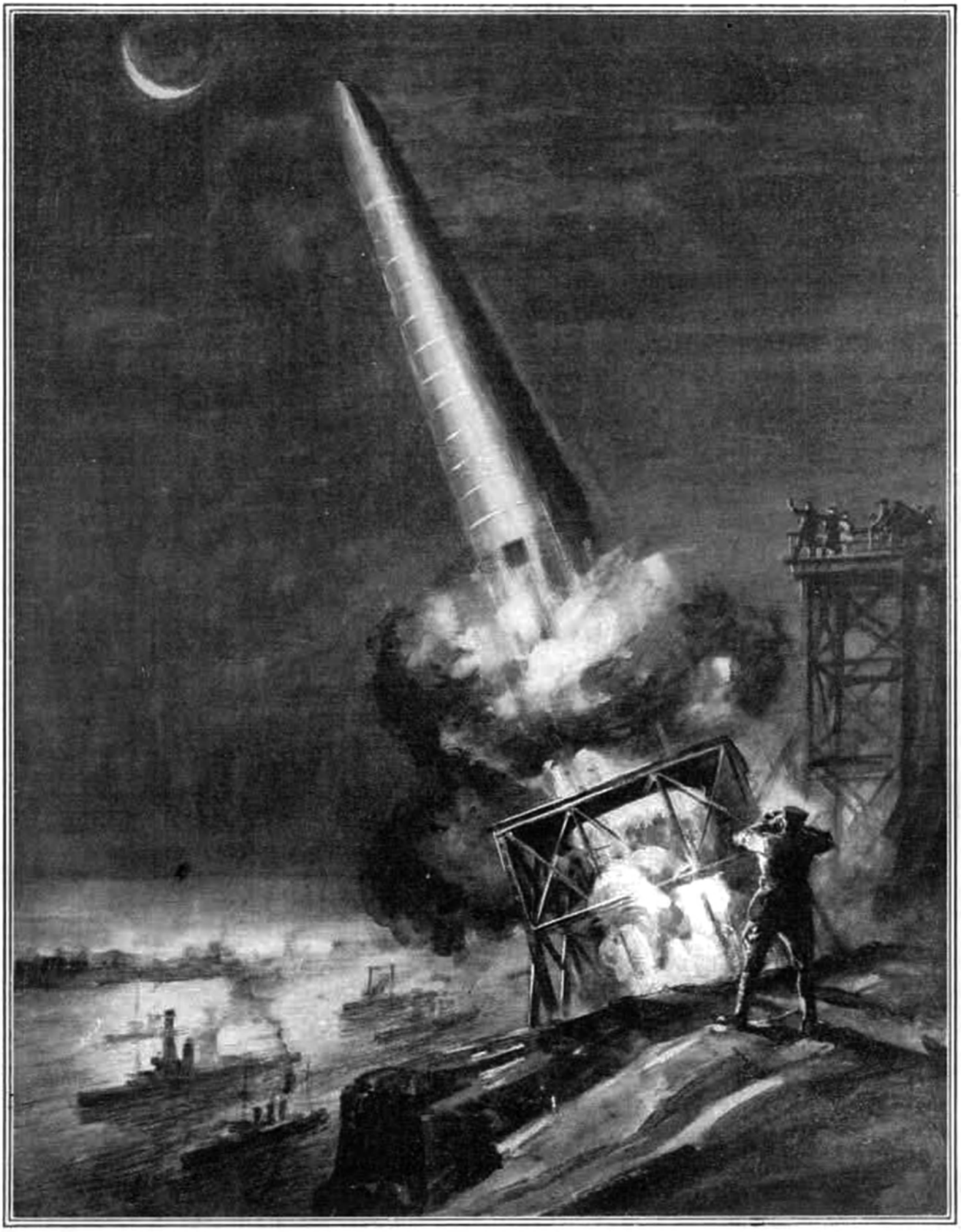
For the present we may leave out of consideration the plan of anything like a personal visit to the moon—the chief difficulties here are physiological, not physical. But we can, if we want to, reach out a long arm and tickle the moon, as it were. Here a new problem arises. Suppose we send a rocket to the moon. How shall we know whether our aim has been true and the shaft has gone home? Professor Goddard has not only worked out the problem on paper: he has conducted experiments to furnish the experimental data required.

It would, of course, be impossible to follow the course of such a small body through the 240,000 miles that separate us from the moon. But the rocket could be made to carry a charge of flash-powder arranged to go off when it hit the moon's dark surface, the event being brought off about the time of new moon. And the amount of flash-powder required can be easily determined by a simple experiment. Professor Goddard found that one fifth of a grain of powder made a flash plainly visible at a distance of two and one fourth miles. To produce an equally visible effect at the distance of the moon would require, accordingly, a charge of about fourteen pounds. Assuming that the total weight of flash-powder, plus accessory apparatus, were four times this amount, the total charge of explosive required would be about seventeen tons. Professor Goddard's invention is intended to carry aloft registering instruments and even cameras.



Here are two forms of Professor Goddard's rocket. Note in each case the tapering nozzle, the fundamental feature of the invention, by which the efficiency of the rocket is raised from the best previous record, namely two per cent, to sixty-four per cent. The drawing on the right shows a double rocket, the fuse of the small upper rocket projecting into the charge of the large lower rocket, so that the small rocket is fired off at the moment the charge in the large rocket is exhausted. The drawing on the left shows a type of rocket in which the charge is divided into a number of separate cartridges, which are fired off one after the other. The ignition is effected by a battery and induction coil. In the head of the rocket is placed a gyroscope which keeps the rocket pointed in one direction

No telescope can follow the course of the rocket; but a charge of flash-powder could be carried which would explode when it hit the moon's dark surface



To Hit the Moon with a Rocket

Professor Goddard, of Clark College, has invented a rocket that operates on entirely new principles, and that would make it possible to hit the moon. It has been estimated that with ordinary rockets it would take 14,290 million million tons of explosives to reach the moon. Professor Goddard's rocket requires only 602 pounds, because the gases are discharged, not at the usual rate of 1,000 feet a second, but at 7,000 feet. The fastest projectile hurled from a rifle has a velocity of less than 3,000 feet a second, from which it is seen what a marked improvement Professor Goddard has made. The total charge of explosive required to reach the moon would be seventeen tons, equal to the total weight of ammunition discharged by a battleship when it shoots off all its guns at once. In other words, Professor Goddard's improvement at a single step transfers the enterprise of hurling the missile to the moon from the class of impractical dreams to the domain of comparably simple tasks