PM

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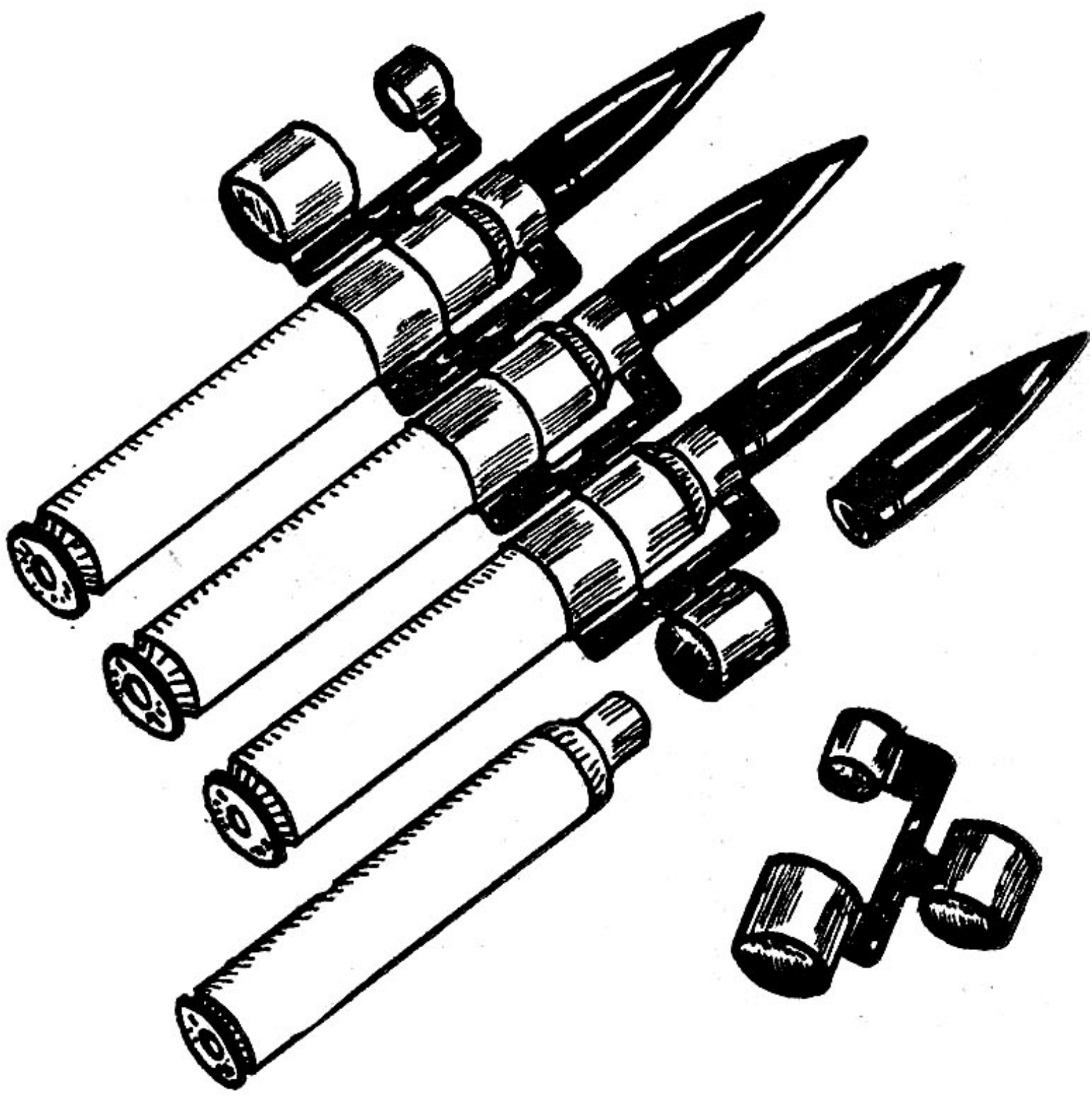
War Weapons: Airplane Ammunition

By Willy Ley

METAL LINKS HAVE REPLACED THE OLD MACHINE GUN BELT

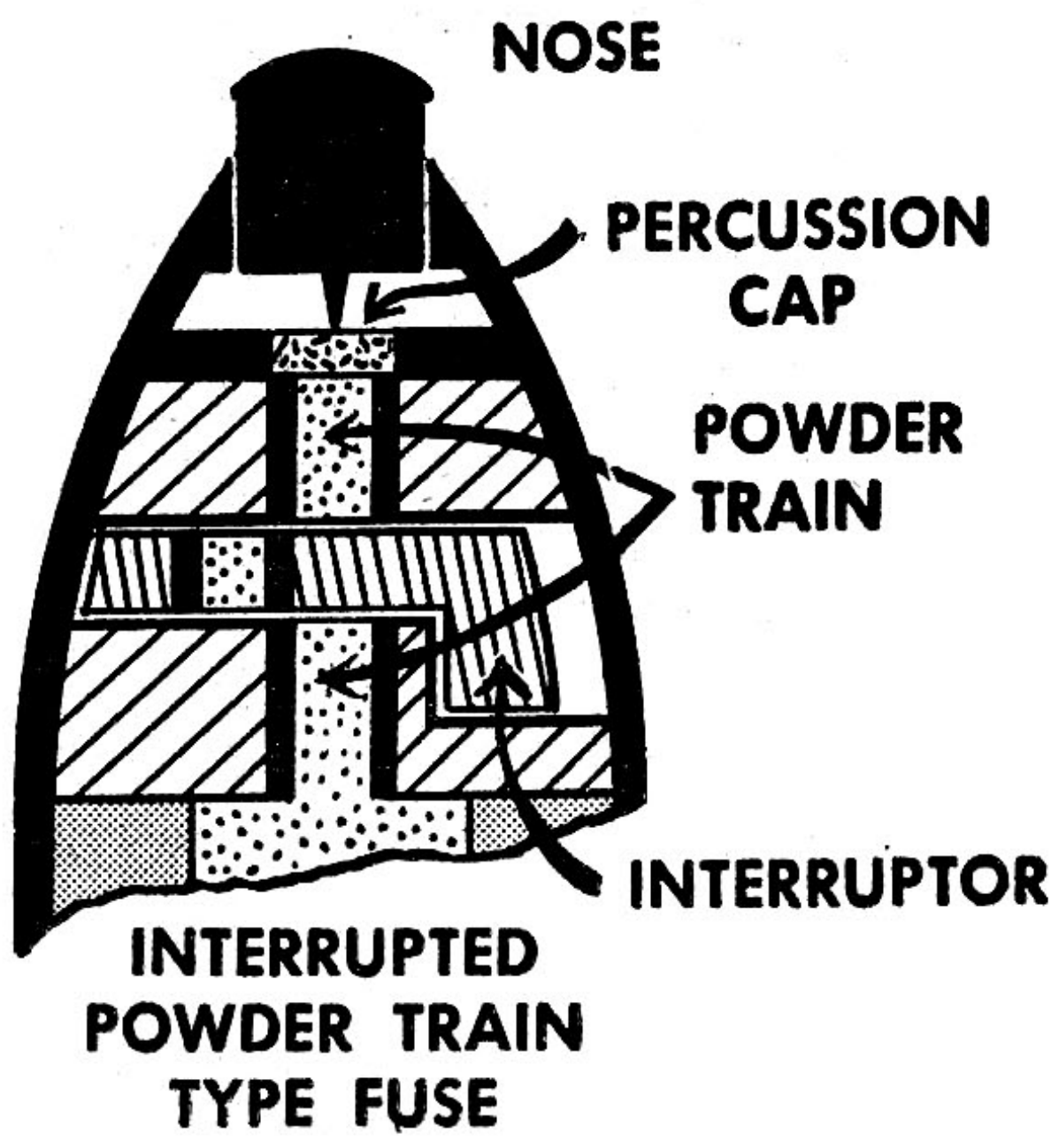


The shells fired from airplane cannon are remarkable mainly for one reason: their small size. The normal caliber of these shells is 20 millimeters, four-fifths of an inch.

But despite their small size they have to have all the characteristics of much more sizable shells. They must be true in flight, they must explode when striking the target, they must explode after some time even if they did not strike the target and, last but not least, they must be easy to manufacture in large quantities and must be perfectly safe to handle until they are actually used.

Depends on Fuse

Most of these demands refer, directly or indirectly, to the fuses of these shells. A shell is safe to handle and reliable when its fuse is safe and reliable. But because of small size and mass production the fuses also have to be simple in construction. No engineer's dream of precision in 47 parts could be accepted.



But while it is an easy task to design a fuse that reliably goes off when striking a target, it requires ingenuity to see to it

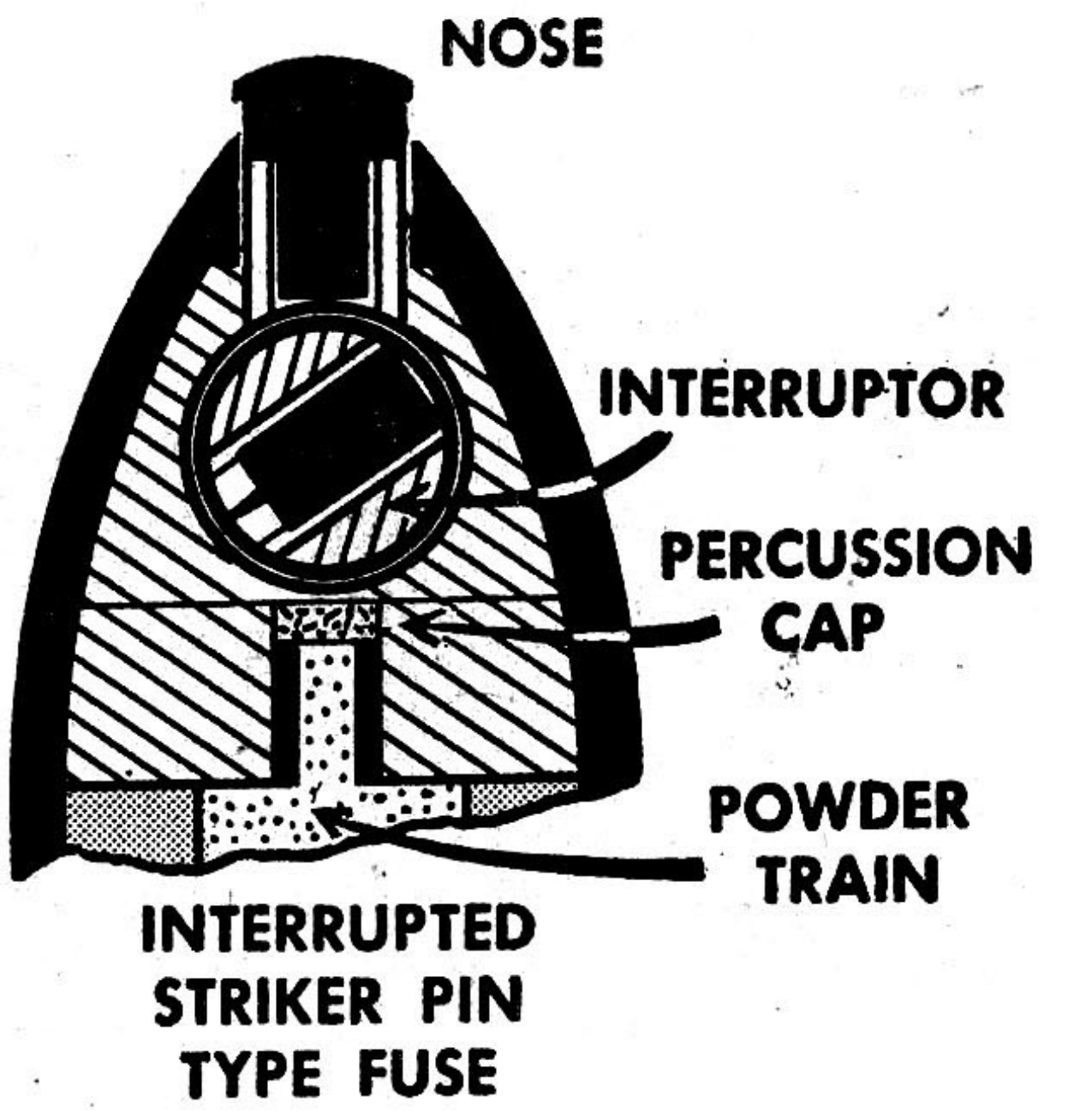
that the same fuse does not go off before the shell has been fired and to do all this with three or four parts.

The diagram shows how that problem has been solved, mainly as regards the safety factor. In principle the fuses are of the simple kind: a firing pin strikes a percussion cap which ignites a short powder train which, in due course, sets off the charge of the shell. The fuses are made safe by interrupting one of these parts and the ingenuity is shown by the method of removing the interruption. It is, in both cases, a utilization of the fact that the shell is set spinning in the barrel.

Interrupted Train Type

In the interrupted powder train type, the powder train can be fired before the shell begins to spin. But the fire can travel for a short distance only, then it is stopped by a solid block of metal. The block is solid, that is, when the shell does not spin. It carries the continuation of the powder train, but in the wrong place. After the shell has been fired, and spins, the whole block is moved over by centrifugal force, the continuation of the powder train is in place and the shell will explode.

In the other type it is not the powder train that is interrupted, but the striking pin. The pin is divided into two parts. The upper part is firmly in place in the nose of the shell, while the lower part is



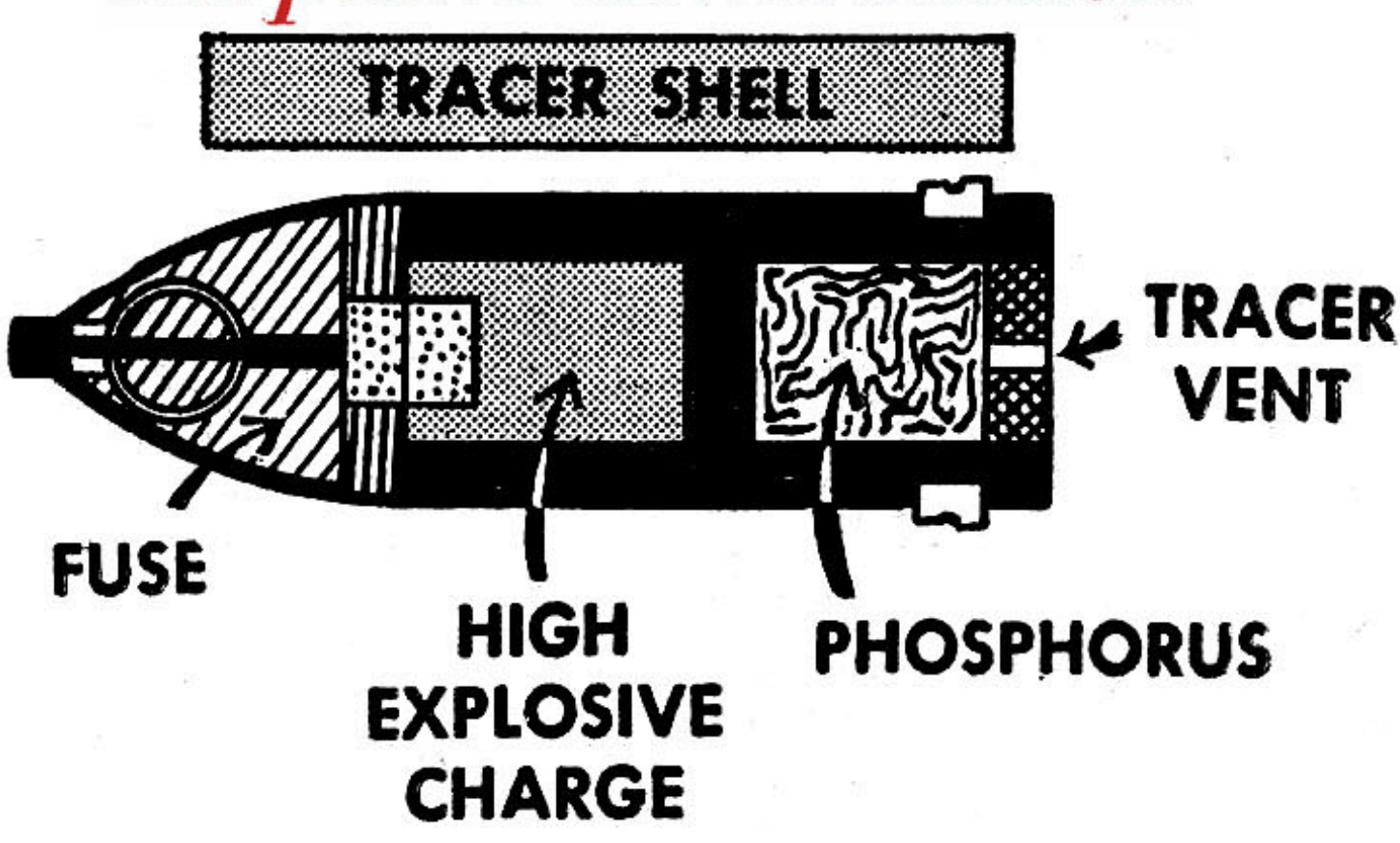
INTERRUPTED STRIKER PIN TYPE FUSE

inserted in a movable metal disk which is normally turned to one side. If the striker is forced down while the shell is at rest, it only hits the edge of the metal disk. But if the shell is spinning, centrifugal force has turned the metal disk around, so that the two parts of the pin are lined up.

Just as ingenious and simple as the fuse constructions are the metal links that have replaced the old machine gun belts. Originally cartridges for machine guns were inserted in belts. It had the advantage that the belt could be refilled, but needed careful guidance through the mechanism of the machine gun to prevent it from jamming the mechanism. This would be impossible with guns installed in airplane wings where there is nobody to guide the belt.

The answer to that problem was the link belt; when the cartridge is fired the cartridge case moves out of the link backward and the link simply falls off.

Since airplane cannon are operated like machine guns it has become necessary to create tracer shells which permit one to observe the line of fire directly. This is accomplished by dividing in two the com-



partment normally containing the high-explosive charge, and by filling the rear compartment with a suitable chemical, for example phosphorus. The tracer compound is set afire in the barrel by the heat of the powder gases and, spurting out through the vent, shows the line of flight. A day tracer produces mainly smoke, so that the trajectory appears as a dark smoky line, while a night tracer produces mainly fire, so that the trajectory can be seen as a luminous line against the dark background.