Tubular Magazines ...ARE SAFE

by R.W. Ballou

LIKE MANY PEOPLE, I've often wondered about the actual safety of tubular magazines, particularly on rifles chambered for high-power, centerfire cartridges. The idea of one cartridge's bullet resting against the primer of the next cartridge in the magazine, under spring pressure and subjected to the slamming forces created by the gun's recoil is, if you think about it, a little less than comforting. And the oft-repeated warnings about never using pointed – or even round-nose – bullets in one seem to imply that an in-the-magazine discharge is a very real (and very dangerous) possibility.

Actually, the safety record of tubular magazines seems to be exemplary. I've never heard of anyone having an accident involving one, nor have I found any available data on the subject, which is something that can't be said about certain other aspects of firearms design. But the questions still remain—what would happen if some circumstance – such as a defective, incorrectly seated or unusually sensitive primer – caused one of the cartridges in a tubular magazine to fire? It's a known fact that a primer not seated fully into its pocket can cause a slam-fire in a semi-automatic firearm. Could a similar thing happen in the magazine of a heavy-recoiling lever gun? And what about the occasional fool who insists on loading spitzer bullets in his 30-30 in the interest of "improving ballistics?" Is such a person putting himself at risk of some kind of gruesome injury? Is the nose of a bullet capable of acting as a sort-of "firing pin" to indent a primer? And in any case, would a chain-fire in the magazine take place, causing all of the cartridges to fire?

To answer these questions an experiment of some kind seemed in order. This experiment would basically have to determine two things: first, the actual likelihood of a bullet's nose setting off the primer of another cartridge in a tubular magazine due to recoil (or other) forces, and second, the damage – if any – that would result to the magazine, the gun and the shooter.

The first part was easy. A simple procedure was devised that involved placing a primed 30-30 case, neck-down, between the jaws of a vise while hold-

"Under the spreading chestnut tree" **photo illustrates the method used to determine the likelihood of a bullet's nose causing a primer to fire in a tubular magazine.**

ing a bullet, nose-first, against the primer with a pair of blacksmith's tongs. The base of the bullet was then struck sharply with a two-pound ballpeen hammer. The force generated by this procedure was far greater than anything that might be generated by a gun's recoil; definitely a beyond-worse-case scenario. Three different types of .308-inch bullets were used for this test: a 170-grain cast flat-point (Lyman #311041), a 170-grain jacketed flat-point (Hornady) and a 180-grain jacketed spitzer (Remington). The cast bullet was of a fairly hard alloy; about 16-18 Brinnell. The primers were standard Large Rifle (CCI 200).

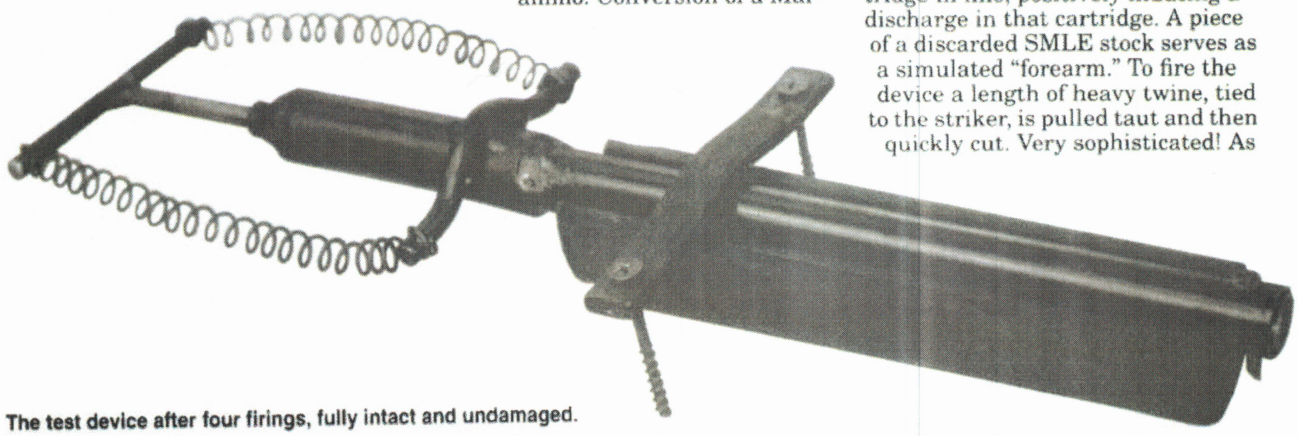
With both the cast bullet and the jacketed flat-point, both of which are intended for use in tubular magazines, it was totally impossible to set the primer off. Repeated hard blows with the hammer resulted in nothing more than mutilated bullets, their noses mushroomed to probably twice their original diameter. The spitzer bullet was another story, however. It did actually fire the primer, although it took five hits to do so. Examination of the bullet's nose revealed that the soft lead forming the point absorbed the first few hammer blows. By the fifth blow, the bullet's jacket was in direct contact with the primer, and was rigid enough (as well as small enough in diameter) to act as the "firing pin." Repeating these tests a second time with all three bullet types provided essentially the same results.

A third set of cases was made up with the primers deliberately seated approximately .020-inch above the base of the case. None of the bullet types caused these primers to fire, including the spitzer bullet. The first few blows of the hammer simply seated the primers fully in the cases, by which point the ends of the bullets were flattened to much greater than their original diameter.

The 170-grain cast bullet loads after being subjected to a test firing in the device. Notice how far the bullets have been pushed into the case necks, and the generally sooty condition of the cases. A large amount of the powder in the first (*ruptured*) case was unburned.

I didn't bother trying a full-metal-jacket bullet of any type. The results with the jacketed spitzer bullet indicate that a pointed FMJ bullet would have probably fired the primer on the first whack. And who would be dumb enough to load such bullets in a tubular magazine, anyway?

The second part of this experiment was a little more difficult. What was needed was some kind of device that would enable me to accurately simulate an in-the-magazine discharge, constructed from materials that are typical of tubular magazine guns, and using full-power ammo. Conversion of a Marlin 336C to a half-magazine (in the interest of improved accuracy) provided me with the basis of this device, a leftover piece of magazine tube long enough to hold three 30-30 cartridges, as well as a suitable length of magazine spring. I welded a simple tubular breech to this piece of tube, which I concocted from two different diameters of small pipe, with a T-shaped striker powered by two external coil springs. The magazine spring and end cap hold the cartridges back with sufficient force to enable the point of the striker to indent the primer of the first cartridge in line, positively inducing a discharge in that cartridge. A piece of a discarded SMLE stock serves as a simulated "forearm." To fire the device a length of heavy twine, tied to the striker, is pulled taut and then quickly cut. Very sophisticated! As



The test device after four firings, fully intact and undamaged.

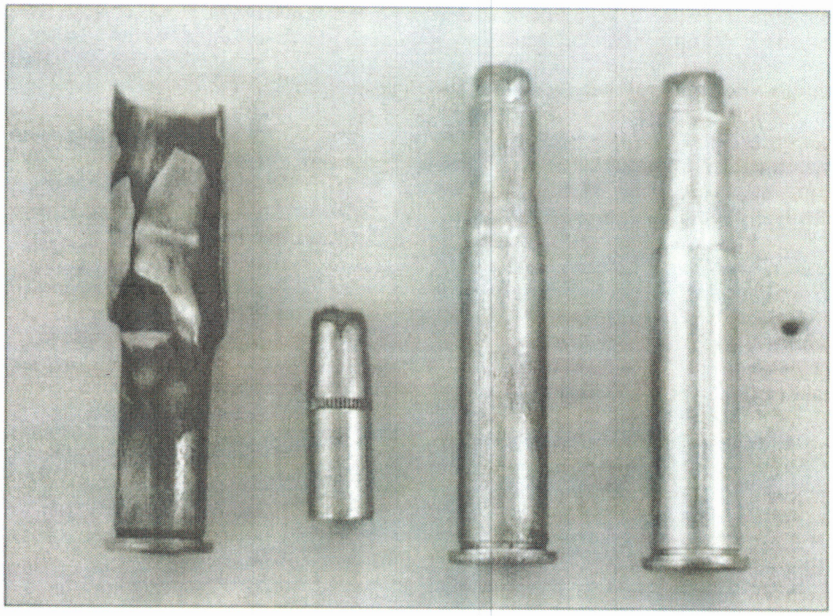
will be seen, the device's capacity of three cartridges was more than sufficient for this experiment.

Now for the fun part. The device was first fastened to a piece of lumber about four feet long, which was placed on the ground and weighted down with four large stones. A white plastic bucket, sawed in half and with a slot to let the trigger string pass through, was placed over it to contain any possible fragments and also help to indicate how much gas, unburned powder, etc. was escaping. The cord used for the first firing was about 30 feet long: I wanted to be well out of harm's way!

Three different loads (of three cartridges each) were used for this test. These were: the 170-grain cast flat-point bullets (Lyman #311041) over 30 grains of IMR 3031, approximately the working pressure of a factory load; some Remington 170-grain factory loads and the 180-grain Remington spitzer bullets, again over 30 grains of 3031.

Frankly, I was expecting some pretty spectacular results when I first fired the device. What actually happened surprised me, to say the least. First, there was a report about equal in loudness to a child's cap gun, followed by a small amount of smoke drifting out from under the bucket. Waiting a few minutes, I carefully removed the magazine's end plug and slid the contents out. Two cartridges, sooty on the outside and with their bullets telescoped back part way into the cases, were followed by the virtually undamaged bullet of the first cartridge, a lot of unburned powder, and finally the cartridge's case, ruptured for about half of its length. The device, however, was fully intact and undamaged.

Repeating the test with the Remington factory loads produced identical results. Obviously the fired cartridge, loosely contained in a magazine's tube substantially larger than its own diameter and not tightly sealed at either end (the same as on an actual gun), was only able to generate enough pressure to rupture its thin brass case, and propel its bullet forward with the relatively small amount of energy necessary to overcome the crimp and bullet pull of the other two cartridges. This telescoping effect certainly absorbed most of the energy being transmitted. The amount of unburned powder indicated that only partial combustion took place due to the low "chamber" pressure generated. And the white plastic bucket, used as a cover, was still perfectly clean on the inside, indicating that only a relatively small amount of gas had actually escaped.



170-grain Remington factory loads after firing in the device.

I was expecting different results with the spitzer bullet loads, but again only the first cartridge fired, with results identical to the other two loads. However, examination of the remains of this firing brought to light an important fact about tubular magazines: the two unexploded cartridges had noticeable marks on their bases (left by the lead nose of the preceding bullet) that indicated the noses of the bullets were making contact partly on the cartridge bases and only partly on the primers themselves. This makes sense, as virtually all cartridges used in the tubular magazines are tapered to a certain extent or have a pronounced rim, or both, causing them to generally lay at the slight angle when loaded in the magazine. In the case of flat-point bullets that have a *meplat* (nose) that's almost as large in diameter as the primer, probably the bullet's nose will be largely supported by the case itself. This fact alone adds greatly to the safety of the tubular magazine concept.

In a last attempt to create a chain-fire in the magazine I made up three more spitzer loads

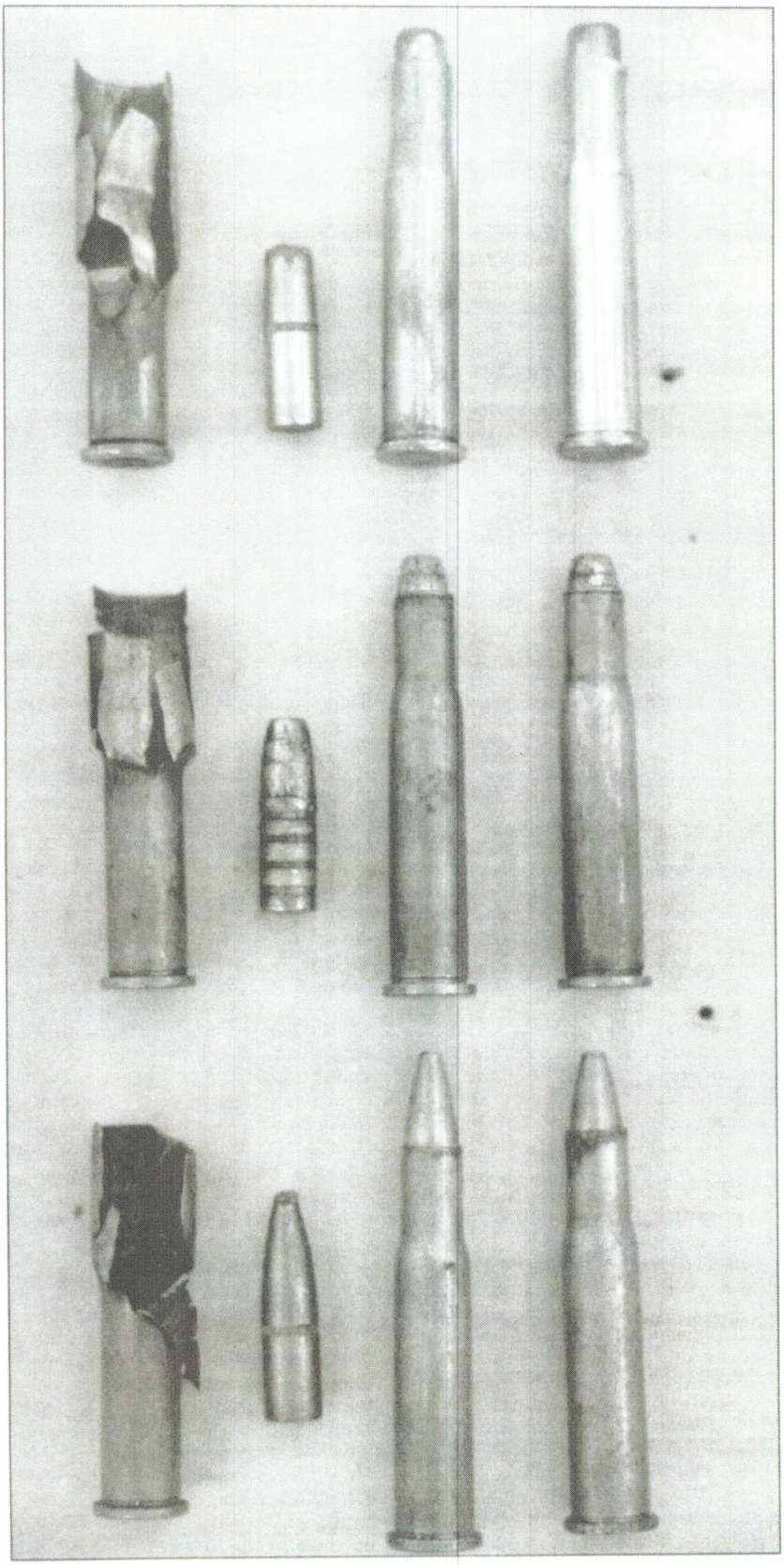
The test device dismantled to show its component parts. Notice the "forearm" made from part of an SMLE stock.

and attached small chunks of cardboard to their necks with tape, to act as "shims" to raise the bullet's noses into direct, center-line contact with the primers. These were carefully loaded into the device, verifying their orientation as each was slid down the tube. Still, only one cartridge fired. The second cartridge in line did, however, have a distinct shallow depression in its center produced by the impact of the fired cartridge's bullet – which obviously wasn't enough to set off the primer.

Pointed, FMJ-type bullets could possibly have created a chain-fire, but again, who would ever use such bullets in a tubular magazine? And judging by the results obtained with the loads actually used, I doubt if a chain-fire would have generated sufficient pressure to do any real physical damage to the magazine or anything external to it.

And what did all of this prove? Basically, this experiment demonstrated that a tubular magazine, even on a high-power rifle generating a substantial amount of recoil, is not a potential shrapnel grenade living between the fingers of the shooter's forward hand. With proper bullets, the chances of an in-the-magazine discharge taking place are minute, and in the unlikely event of one happening, the results would not be catastrophic – to the gun, the shooter or any possible bystanders. The real danger to the shooter would be from escaping gas, possibly blowing back into the shooter's face and eyes. And, remember, this experiment in no way quantified how much gas was actually released, although all indications were that it was only a fraction (in terms of volume and pressure) of what might be released by a ruptured cartridge in the chamber of the gun. And the actions of most lever-action rifles are pretty "leaky," especially around the bottom where the lever pivot is. Most of the gas would probably take this route to escape.

None of this is to say that the usual safety precautions regarding tubular magazines (such as never using pointed bullets in one) should be ignored. Far too many people can't be bothered to wear eye protection when they shoot: for them following *all* other safety precautions is doubly important. But tubular magazines *are* safe, possibly even safer than box magazines, which place a number of cartridges seemingly in harm's way directly below the rear of the chambered round. But that's a subject for another experiment! •



The three different loads that were used in the test. *Top:* 170-grain Remington factory load. *Middle:* 170-grain cast bullets (Lyman #311041) over 30 grains of IMR 3031. *Bottom:* 180-grain spitzer over 30 grains of IMR 3031. Results were virtually identical with all three loads. All bullets were firmly crimped in the case necks.