GUNPOWDER TESTING - EPROUVETTES

By Dick Salzer

INTRODUCTION

The invention of gunpowder and its development is fraught with mystery, rumors, folklore and confusion. Without once again trotting out all of those tales and supposition, suffice to say that until in 1792 when the great French chemist, Berthollet, after much experimentation, concluded that the best ratio was 75 parts saltpeter, 12 parts sulfur and 13 parts charcoal.

But even with the ratios established and quite well accepted, there still were many variables:

- the type of wood used for the charcoal and method of its conversion to charcoal
- the purities of the sulfur and saltpeter
- the method of consolidating the components into a viable granular form
- and, of course, there were always a few scoundrels that would adulterate gunpowder with cheaper chemicals.

Quality, therefore, varied wildly and the resultant product was irregular and unreliable. It was inevitable that means of assessing the strength of gunpowder, some form of testing would be developed. In the beginning, the simplest test was to lay out a few grains on the bench top and touch them off with a match. As shown in the drawing, Figure 1. Examining the residue yielded a subjective indication of quality.

As early as the 15th Century, chemists and alchemists were devising formulations and methodology for making and evaluating gunpowder.

Early Gunpowder Testing

The first gunpowder was so unreliable and variable that means of objectively quantifying its power became very important. Many scientists of the period set to task to develop techniques to determine that strength. Here are a few of them and their approaches.

Nathaniel Nye - 1647

Probably not the first but surely the most concise is this description of assessing gunpowder by Nathaniel Nye in 1647 as he employs sight, feel, taste and divination:[1]

"How you may, by taste, feeling, colour and burning, know good and ill powder and how amongst many sorts of Gunpowder, you may know the best sort"

He outlines 14 tests based on observation and tasting. A sampling of his thoughts follows:

- By how much the gunpowder is harder by feeling, by so much the better it is.

-Lay three grains of gunpowder on a piece of white paper, each which are three fingers width apart and put fire to one grain. If they all fire at once and there is no grossness remaining, the powder is good……

-if good gunpowder be laid upon the palm of your hand and set on fire, you will not be burned. (Kempers tried this and raised blisterss on his hand)

-Gunpowder that hath a very sharp taste, hath an abundance of the Peter not refined and will moisten.

Later in his life, Nye developed a vertical tester, much like the 19th Century version shown in Figure 3.

Ever the pragmatist, Nye also mentioned that if one fires a pistol ball into a bank of clay one can make a comparative evaluation of relative strength by measuring the depth of penetration.

William Bourne - 1587

Bourne may be credited with the first mechanical tester in 1587, as shown in Figure 2, it consisted of a hinged, weighted cover that would blow open and, depending on how far it moved up the ratchet, registering relative powder strength.[2] No known specimen remains but Kempers made a modern replica, which he describes in his book[3] (referenced in bibliography).

Johannes Furttebach – 1627

Furttenbach, in Germany, was thinking along the same lines of Nye and devised a vertical contraption whereby a weight was blasted vertically along a track and the height it obtained was an accurate measure of powder strength.3

Artillery Testing

The need to understand the strength of powder used in artillery applications is quite obvious as it directly affected the trajectory of the missile. Both French and English (and probably others) used a very simple, empirical method for classifying powder strength[4, 5]. An early text (somewhat paraphrased) describes this method:

"If you can get a little morter piece (sic) cast at a foundry w here iron is made, Let it be about three inches at the mouth with a chamber about one third inch, but put no wad because wads may be of different thickness and cause error.

Put into your morter a ball of lead or iron that will just fit the bore. If of lead it will weight five pounds, if of iron about three and a half pounds. The morter shall be set at a certain and unvariable elevation and then being discharged shall by its different ranges tell the exact difference of powder…."

Ingenuity Reigns

As the images accompanying this article may show, there was considerable variety to the approach. Nearly every method for providing a measurable counterforce to the controlled explosion of gunpowder was used—friction, gravity, weight displacement, (including liquids), spring tension all had their adherents and some clever mechanisms evolved.

Some were complex and some very simple. Some were purpose-built and some used reclaimed pistol locks and stocks. All are interesting and most can be considered quite rare. The following examples, with the exception of Figure 23 are from the author's collection.

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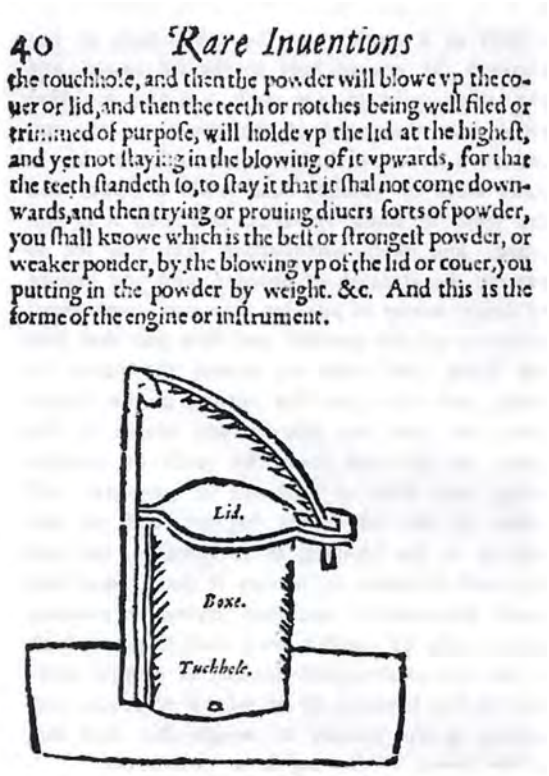
Figure 1. The earliest method was to simply touch off a small amount of powder and observe the flash and ash.



40 *Rare Inuentions*

the touchhole, and then the powder will blowe vp the couer or lid, and then the teeth or notches being well filed or trimmed of purpose, will holde vp the lid at the highest, and yet not staying in the blowing of it vpwards, for that the teeth standeth to, to stay it that it shal not come downwards, and then trying or prouing diuers sorts of powder, you shall knowe which is the best or strongest powder, or weaker ponder, by the blowing vp of the lid or couer, you putting in the powder by weight. &c. And this is the forme of the engine or instrument.

Figure 2. The first recorded mechanical powder test. Kempers built a modern replica and found that it was quite effective.

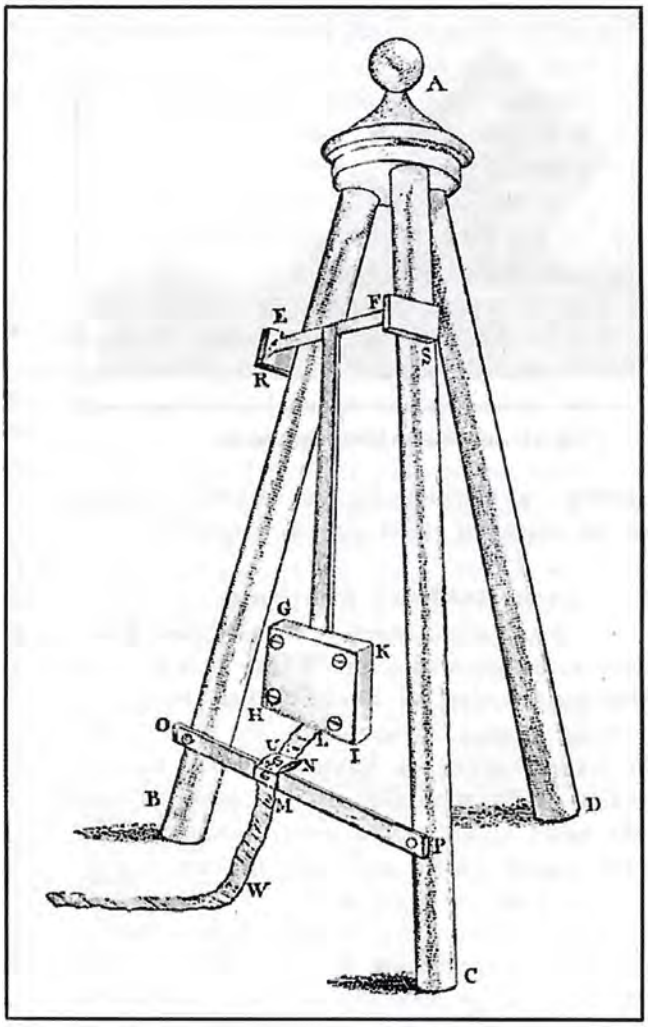


Figure 3. A crude ballistic tester. Firing a measured charge using a standard weight ball against a pendulum caused a tape measure to be dragged over a marker and record the power of impact.

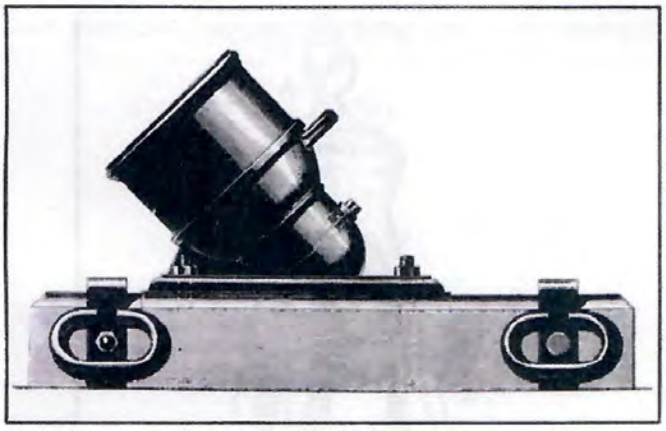


Figure 4. A small mortar of fixed elevation using a measured charge fired an iron or lead ball of standard weight was fired down range. The distance traveled was paced off to classify the power of the powder.

Figure 5. This elaborate laboratory tester fired weights of various sizes, vertically, to measure the height achieved. Probably dates from the mid-1850's.

Figure 6. The earliest tester in my collection, probably dating from the end of the 1600's. This pattern is illustrated in St. Remy' s treatise of 1697.

Figure 7. A rare touch-hole fired tester, one of two known to exist. The other is in the Victoria and Albert Museum in London.

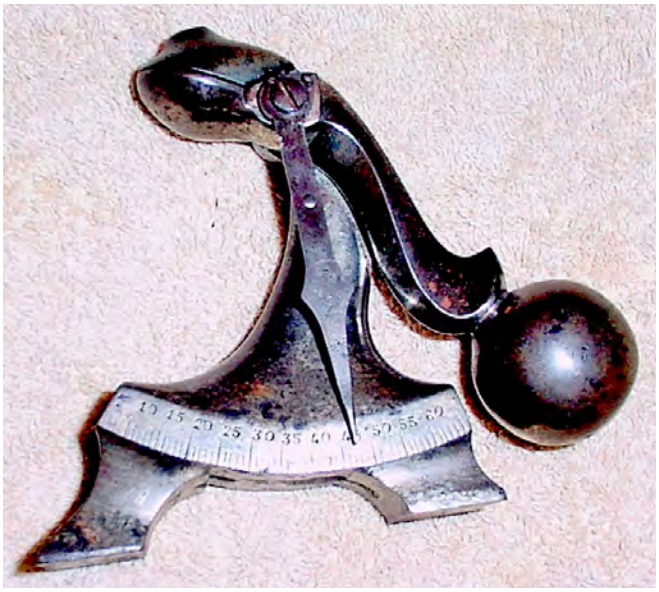


Figure 8. An early French tester, firing a tiny quantity of powder by touch-hole causes the weight to swing and the pointer to register the travel.

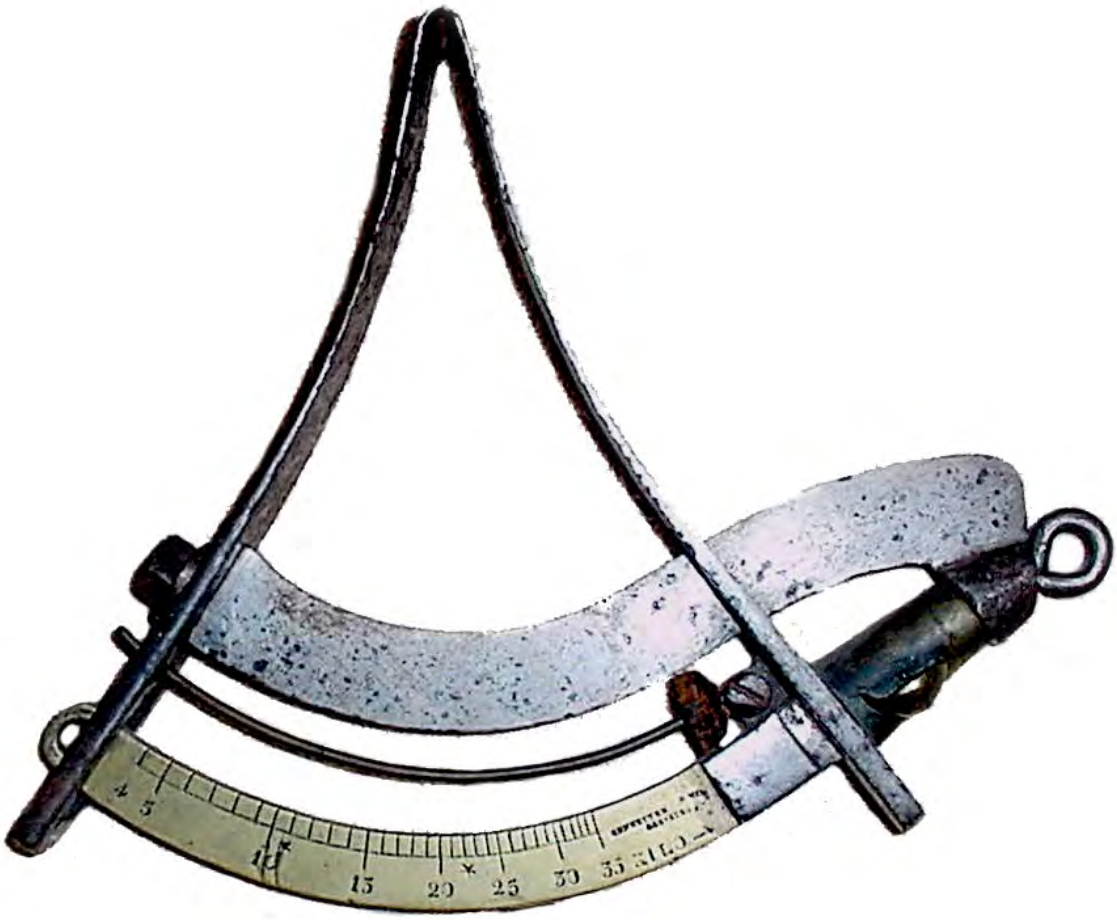


Figure 9. This spring tester is fired by touch hole causing compression of the spring. A leather washer marks the degree of movement. The spring testers are sometimes found attached to the barrel of a pistol and fired by flintlock or percussion cap.

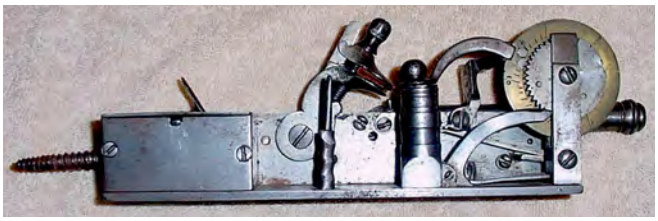


Figure 10. Probably one of the most complex devices dreamed up by an ancient inventor, this combination tinder lighter/ powder test has a gun barrel attached for good measure. It probably dates from the early 1700's.

Figure 11. A very early, simple, purpose-built flintlock tester, circa 1730.

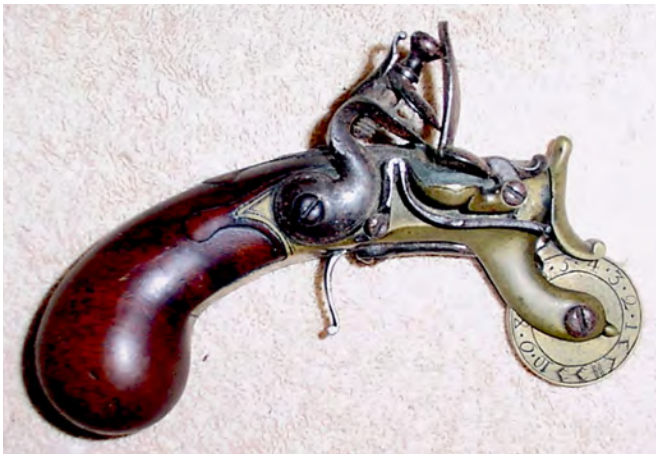


Figure 12. An elegant, tiny, Queen Anne style flintlock tester of about 1780.

Figures 13. An assortment of re-purposed flintlock pistols, illustrating the many mechanical approaches to conversion---from crude to elegant.

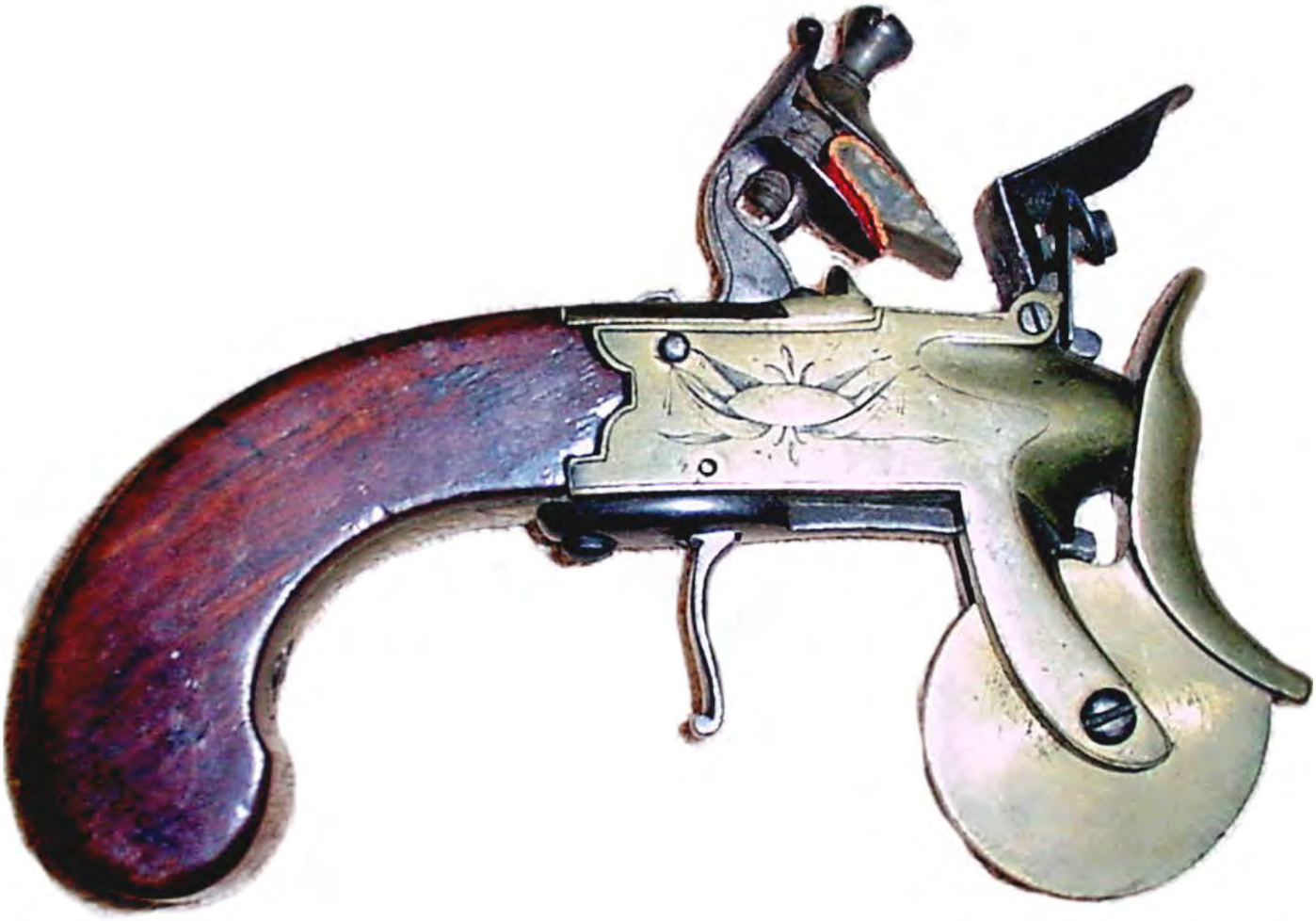


Figure 14. A very common British pattern, purpose-built. Early 1800s.

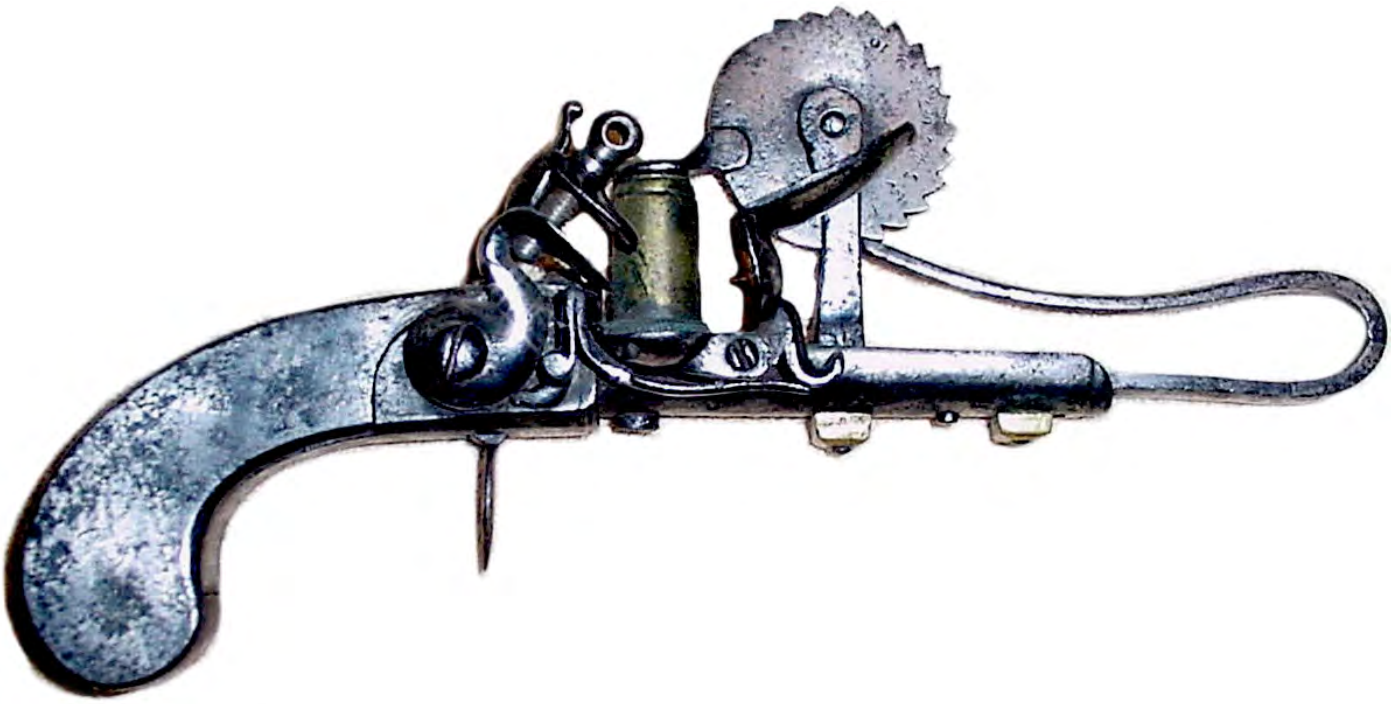


Figure 15. An all-metal flintlock tester, probably French or Belgian, circa late 1700s.

Figure 16. An unusually complex English tester. The indicator is a solid brass disc with ratchet teeth.

Figure 17. The ultimate refinement in late testers. This British tester has a sophisticated internal spring mechanism. Circa 1835. Percussion testers are unusual because by the advent of the percussion system, powder quality was more reliable.

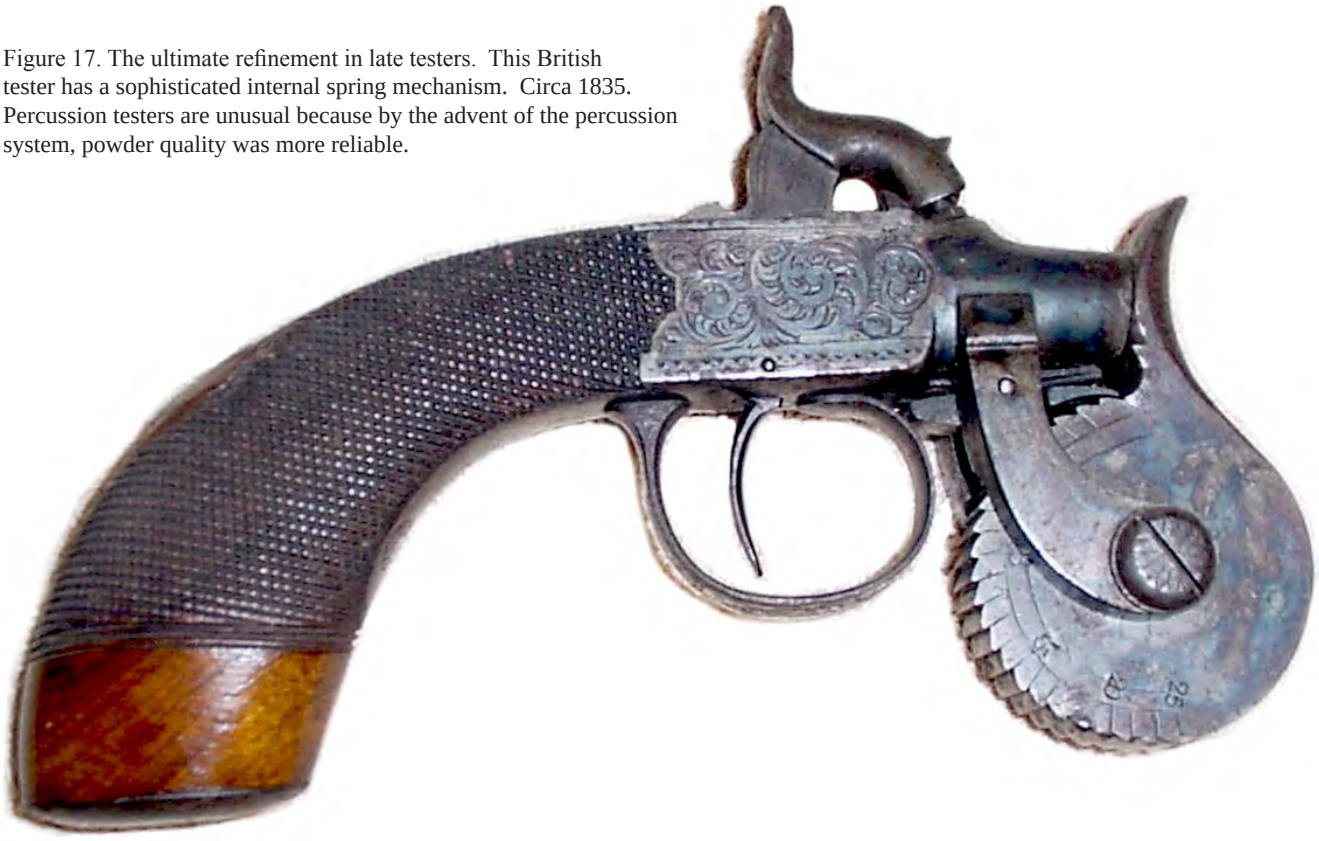


Figure 18. An unusual percussion tester from Holland. This one has two different powder chambers that can be rotated to align with the activator arm, probably from about 1840.

Figure 19. A simple French percussion tester, probably from about 1840.

Figure 20. A real puzzler, it has all of the hallmarks of a U. S. arsenal made piece but no record has been found of such an item in any inventory archives.

Figure 21. A simple French or English percussion tester. Accidently buying this at a local auction it is what started me collecting powder testers.

Figure 22. These simple, hand-held testers span nearly 150 years. The topmost is the earliest, about 1720, in the middle, about 1810 and the lower one, marked “Hawksley” from the mid-1860’s.

Bibliography

Baddeley, F. *Manufacture of Gunpowder*, Walton Abbey, 1857

Muller, H. G. “A Brief History of Powder Testers”, Arms and Armor Annual, 1973

Wolf, P. J. “Powder Testers”, American Arms Collector, Towson, Maryland, 1958

Note: A very extensive bibliography on powder testers can be found in Kempers work[3]

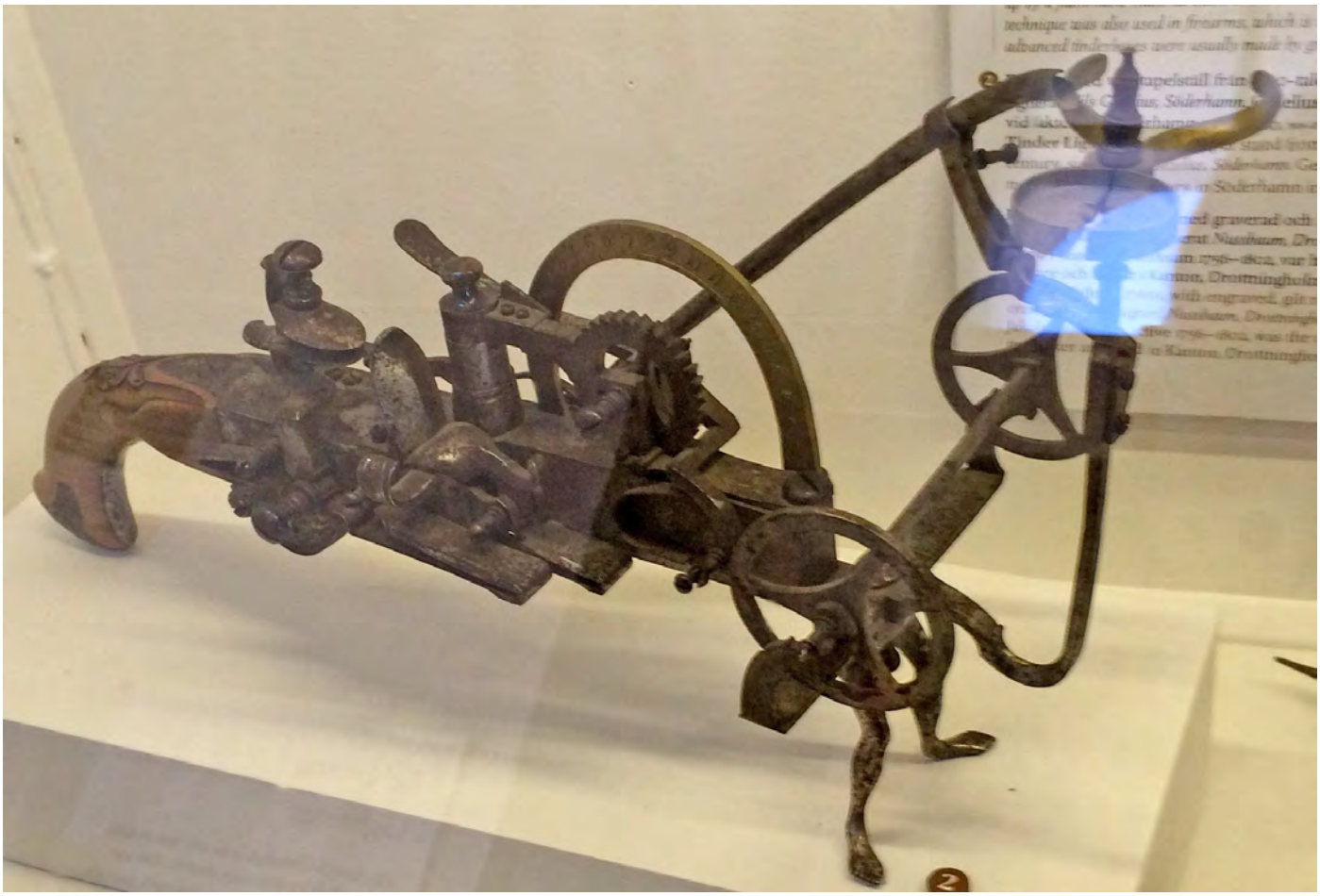


Figure 23. One of the most fascinating testers I've seen is this combination tinder lighter/powder tester. I took the picture through the glass at a Stockholm museum. Unfortunately, they ignored my request for a better image.

Endnotes

1. Nye, N. *The Art of Gunnery*, London, 1647
2. Bourne, William. *Rare Inventions and Devices for Generalles and Captains*, 1547
3. Kempers, R. T. W. W. *Eprouvettes: A Comprehensive Study of Early Devices for Testing of Gunpowder.* Royal Armories, Leeds, UK 1998
4. Saint-Remy, S. de. *Memoires d' artillery*, 1697
5. Rodman, T. J. *Experiments on Quality of Cannon Gunpowder*, U. S. Ordnance Dept., Boston, 1861 U. S. Ordnance Dept.