remarks, it is clear that only two or three arms would have been produced.

The other extremely rare version of the Westley Richards rifle is that fitted with Sir T. Troubridge's regulator. As Deputy Adjutant-General this officer was so worried by the prospect of troops blazing away their ammunition when armed with a breech-loader that he devised this gadget to reduce the rate of fire to that of a muzzle-loader. Normally a soldier could manage, with Westley Richards's rifle, to get off four rounds a minute. When, however, he was obliged to unscrew a bolt before he could open the breech and then to screw it back again before he could place the hammer in full cock he could expect to fire only two to three rounds per minute. There was an overriding female screw, which only N.C.Os could turn with a special key, in order to disconnect the device. The Ordnance Select Committee expressed themselves opposed to Sir Thomas's scheme. They felt that thorough training was the only satisfactory method of ensuring that a breech-loading arm was used intelligently. Again it is not clear how many rifles were fitted with this regulator for experimental purposes but it is likely that the number was very small indeed.

It has been impossible to outline the detailed development of Westley Richards's military breech-loading arms without making occasional references to the changes that were also taking place in ammunition designed for it. Perhaps a few words in summary might not be out of place. Experiments made subsequently to 25th April, 1861, showed that the early pattern conventionally shaped bullet was by no means the best suited to a breech-loader. A new bullet, in which the diameter of the body was reduced from ·457 in. to ·447 in., proved to be much more accurate. The secret of its success obviously lay in the fact that, (289) at its base, there was a narrow band where the diameter of the bullet was brought up to ·467 in., later ·468 in. The object was to ensure the minimum of friction consistent with satisfactory rifling. The base of the bullet was solid and its weight 400 gr, the same as the old pattern. It was found, incidentally, that long-chambered carbines would shoot well with the new bullet and a slightly increased charge of 2¼ dr. to take up the extra space in the chamber, but the best shooting was still made with the new bullet fired from the short chamber with 2 dr. of powder.

A great deal of time was spent over the problem of lubrication. Westley Richards produced a new lubricant called WR No. 9 which was less affected by high temperatures but it was his WR No. 8 which remained the standard recipe. One of the most successful modes of application tried consisted of waxing the bullet and applying WR No. 8 to the wad and powder case only. The composition of this famous lubricant, according to Westley Richards, was as follows:

81 lb. 13 oz.	$\frac{1}{1}$ of distilled acidified palm oil
9 lb. 1 oz.	$\frac{1}{11}$ lead soap
9 lb. 1 oz.	$\frac{1}{11}$ distilled resin
21 lb. 4 oz.	Good castor oil

or, according to the W.D. Chemist, who was sent a sample to analyse:

21	Castor oil
9	lead soap
9	distilled resin
82	distilled palm oil (nearly)

What was the final fate of Westley Richards's breech-loading small arms? So long a period elapsed between the first acceptance of the system and the ultimate manufacture of a sufficiently large number of arms for extensive troop trials that Westley Richards fell victim to changing military opinions. One has only to read the report made by the 13th and 18th Hussars in Canada on the difficulties of operating Westley Richards's capping carbines in extreme cold. The lubrication became frozen in the chamber and the cartridge had to be forced in with a stick. It can be no surprise therefore to find that the Duke of Cambridge himself, as Commander-in-Chief, was, by August 1866, recommending that the 20,000 carbines should be sold to a suitable foreign purchaser and a Snider conversion of the 1861 pattern Cavalry carbine substituted in the Service. In July 1866 Westley Richards had been asked if he would produce an example of his carbine converted to centre-fire. His refusal served him ill: when in July 1867 he submitted (358) (359) a possible design it was deemed too late to reopen the question. The example at Enfield is dated 1869, by which time there were a good many small-bore breech-loaders with more convenient systems than a central-fire version of the monkey-tailed action.

One final word must be said on the subject of Westley Richards's monkey-tailed rifles. In the competitive trials which took place in 1864 to find the most suitable conversion unit to adapt the P/53 rifle musket to breech-loading Westley Richards entered his system. The illustrations show how easily these large-bore arms may be confused with his small-bore rifle; in fact, their inclusion in this volume is solely for this reason, as they more properly belong to an era later than that covered by this book.

In the course of this chapter reference has been made only to carbines and rifles but Westley Richards achieved yet a further successful application of his system of breech-loading. In February 1863 he submitted a pistol, which eventually was tried by the Ordnance Select Committee against the 8-in. Service Cavalry pistol of the pattern approved on 30th December, 1861. The results of the trial conclusively proved the superiority of Westley Richards's pistol with its 11·9-in. barrel and small bore. Firing a 325-gr. solid base bullet with a charge of 1 dr. of Curtis & Harvey No. 6 it returned the figures of 4·08 in. and 7·68 in. at 50 and 100 yards respectively. The equivalent figures for the Service pistol were 6·48 in. and 10·92 in.; needless to say, both arms were fired from a shoulder rest. The only technical factor militating against the breech-loading pistol was its size and weight. Against the Service pattern's 2 lb. 9½ oz., 3 lb. 5¼ oz. was very noticeably heavier. So far as loading was concerned there was no trouble at all and the breech was absolutely gas tight; the insurmountable barrier to its introduction into the Service was simply that the authorities could see no real military advantage in it.