Welded Shotgun Barrels

The 'figure' so prized in a Damascus barrel was its greatest fault

By James L. Pickens

THE barrel of the muzzle-loading gun, though a simple tube, presented early gunmakers with a difficult manufacturing problem. This resulted in most barrels being made by specialists using procedures which they developed over many years.

The centers of production during the 1600's and 1700's in Europe were Suhl in Germany; Gardone near Brescia in Italy; Madrid, Spain; London and Birmingham, England; and St. Etienne, France. Barrels from these points were shipped throughout Europe to be assembled in guns.

Until about 1650, the most popular method of fabrication was as a tube welded in a seam along the underside. This was done by heating an iron bar in a forge and hammering it into a strip. This was then formed into a tube with the edges lapped, and heated in the forge. At the proper heat it was taken out and a weld made by hammering the seam until it was invisible.

The strength of such a barrel depended on the quality of the iron ore, the skill with which it was smelted, and the skill of the craftsman to form a perfect weld. There was little control of smelting processes so the original metal tended to contain impurities according to the ore quality. No flux was used in welding and surface scale was hammered into the metal though great care was taken to prevent it. Sufficient strength was obtained by making the barrel as thick as past experience had shown necessary to prevent bursting.

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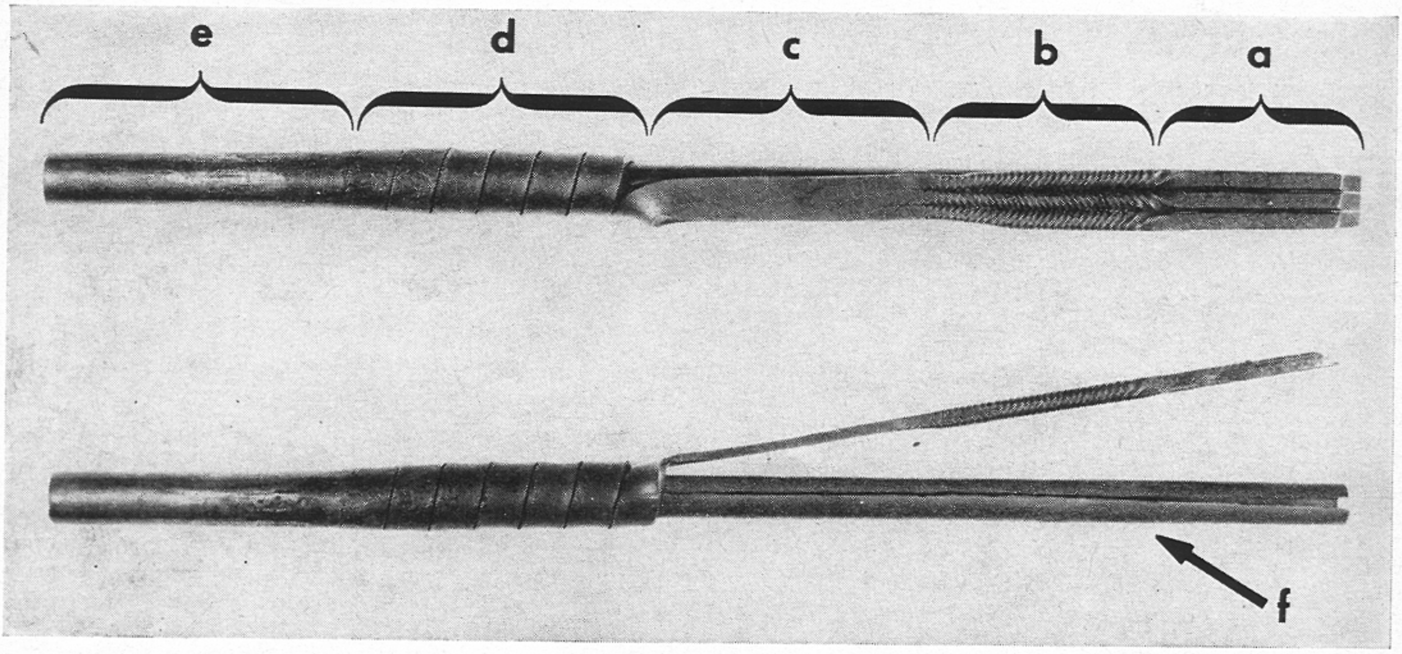
Proving barrels

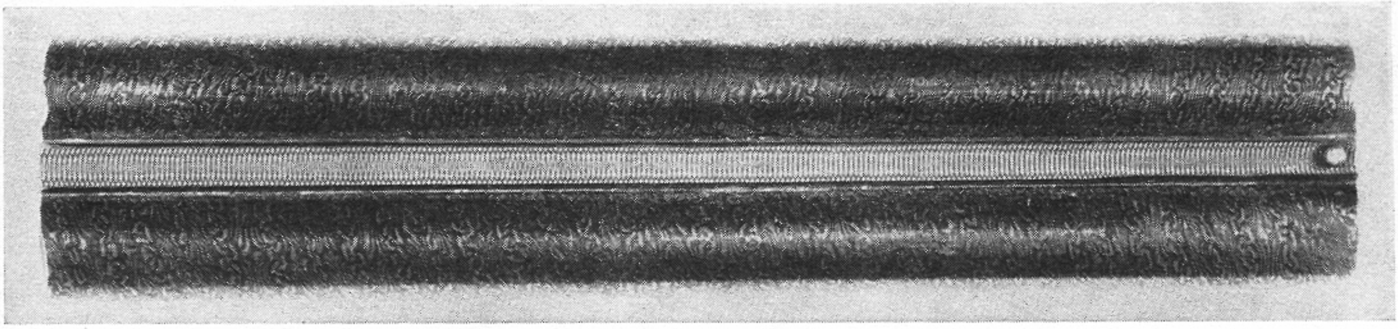
Proof testing was practiced by the better gunmakers. The proving charge was devised by the barrelsmith and generally lay between the heaviest charge likely to be used in service and the charge which the maker thought the barrel should stand.

The single strip method of barrel-making had several obvious disadvantages. Accordingly, a method was devised whereby several small pieces were used and the barrel built up in sections. This system enabled the smith to replace any portion which contained a fault. It was also used to make seams overlap several times and resulted in a stronger barrel.

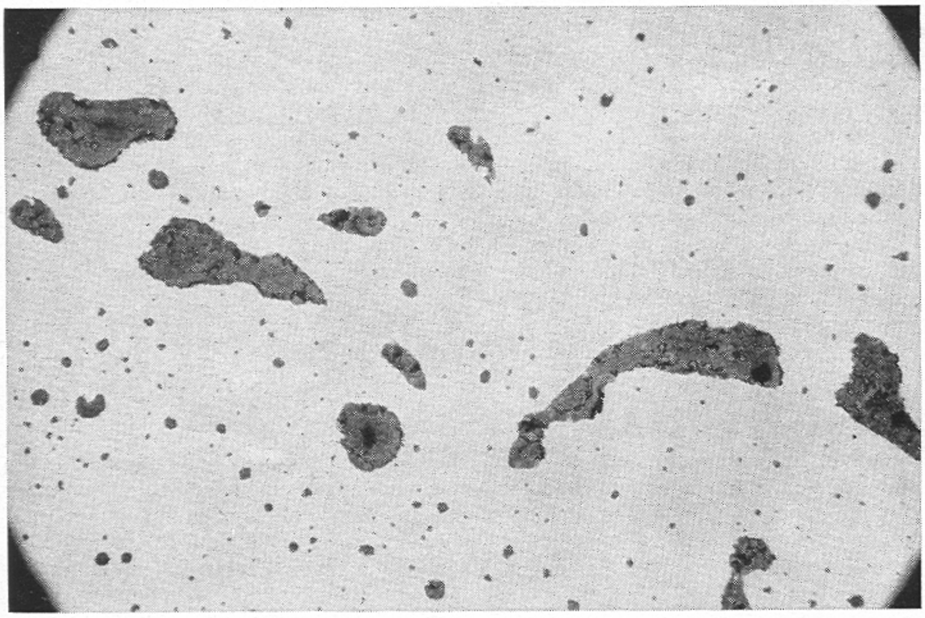
The next improvement came during the early 1700's. Nicolas Bis, a famous Spanish gunmaker (Spain and northern Italy then held the lead in gunmaking) was one of those who turned their talents to finding a better raw material for barrelmaking. It has been said he discovered that Biscayan horseshoes had superior qualities as a gun iron. It was ductile and tough, which were the two most sought-for qualities to withstand the shock of the powder explosion. His method required 50 pounds of the material. This was divided into five lots and each lot joined together to make a



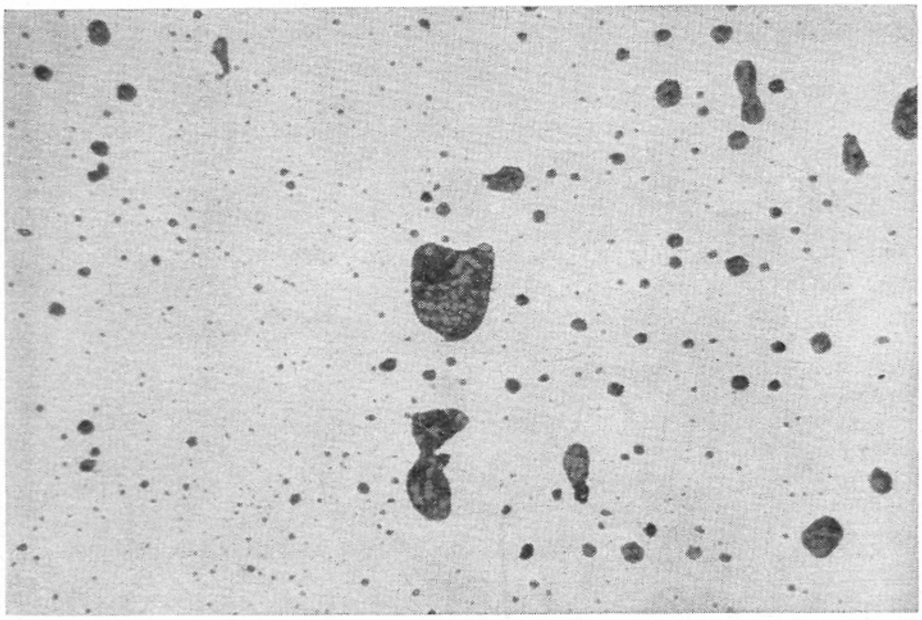
Two views of a demonstration unit which show how a three-iron barrel was made. The three separate irons (a) are first twisted individually (b), then welded into one flat (c), which is wrapped around mandrel (d), and hammered to form the barrel proper (e). The split mandrel (f) is clearly visible



A six-inch section of Damascus barrels showing the 'chain' figure that was sought for and considered an indication of barrel quality though in fact it was not



Section of skelp barrel taken about six inches from breech end, magnification 250X



Section of barrel with chain figure taken about six inches from muzzle, magnification 250X

flat sheet. The sheets were then formed around a mandrel and welded to build up the barrel. From the 50 pounds of the original material the final product was a five-pound barrel.

This general procedure, with its many variations, spread over Europe and remained in vogue until the end of the century.

In 1798, William Dupein of England patented a process for using both iron and steel in gun barrels. His method consisted of wrapping alternate layers of sheet iron and steel around a mandrel, heating the unit, and hammering a weld. The mandrel was bored out upon completion of the welding operation.

J. Jones patented in 1806 an improvement for forging barrels which consisted of twisting a 'skelp', or beveled-edge strip, spirally around a rod so that the edges overlapped. The whole was heated and joined in a weld, after which the rod was bored out. This process evolved to the manufacture of so-called Damascus barrels.

Attempt at mechanization

About this time an attempt was made in the mechanization of barrel manufacture. In 1808 Benjamin Cook patented an invention for making barrels with heavy equipment. The procedure consisted of rolling a bar of iron or steel, then drilling a hole through it. The heated bar, with the hole filled with a mandrel, was then drawn through rollers with tapered grooves into a barrel of the required length. This system was later modified whereby the hole was punched in the bar and then gradually drawn out on the mandrel. Both methods produced barrels without a seam or weld. Unfortunately, these processes proved too costly and were abandoned in favor of the welded barrel.

Laminated barrels were first built up from scraps of the best iron and steel. These were placed in a tumbler which was run until all parts were bright. The scraps were then cut into pieces of the same size and placed in a furnace until at white heat. The mass was then placed under a tilt hammer and welded into a block which was immediately rolled in bars. The bars were then cut in equal lengths and the required quantity laid together and welded in a strip. The strip was then reheated, hammered under the tilt, and rolled into a rod of the required size for the barrel welders.

As the processing of pig iron and steel improved, the use of scrap declined except for the cheapest barrels. Essentially, the bloom was hot-rolled into a bar about ten feet long. The bars were cut in equal lengths, fastened in fagots, reheated, and welded under the tilt hammer. These strips were rolled into narrow rods of the sizes required by the welders. The fagots were heated seven times with a considerable loss of metal, about 40 percent. This, however, was quite an improvement over the methods of 1700, by which the loss ran above 80 percent.

'Figure' was esteemed

Appearance was determined by the proportion of iron and steel, and the 'figures' that resulted from the combination and twist used. The laminated steel was composed of a comparatively high percentage of steel, the best English Damascus and laminated steel contained about 60 percent steel, and the best silver steel was approximately 75 percent steel. For skelp barrels, the thickness of iron was twice that of steel, with the iron and steel in alternate layers.

In Damascus barrels much importance was assigned to the figure resulting from the combination of iron and steel rods, the rod sizes, and the twist of the rods used. A typical three-iron barrel was made by heating a 5/16-inch square rod to red heat, then inserting one end in a square hole in a block made fast to a frame. The other end was placed in a similar square hole in a movable head, which was turned to twist the rod, giving it an outside thread. The untwisted ends were cut off leaving a rod about 39 inches in length. Three of these twisted rods were welded together forming a strip of ½ inch by 7/16 inch for the breech and a similar strip ½ inch by 3/16 inch for the muzzle end.

Upon receiving the strips the welder proceeded to twist them, using a geared machine with a movable bar which pushed the strip around a mandrel. The operation was done cold except for the heavier strips used in the breech ends of large guns. The coiled strip was heated and a steel mandrel inserted in the muzzle end. The unit was then hammered in a grooved anvil until the weld was thoroughly made. The breech end, usually about six inches in length, was formed in the same fashion. A piece was cut from each coil and the two were joined to form the barrel. Octagonal barrels were produced in an anvil with its groove appropriately shaped.

A common procedure

The foregoing procedure was common in England until the advent of the one-piece steel tube. On the Continent the procedure was much the same, except for the use of smaller forges and the heating of smaller sections of the barrel at one time. More attention was paid to the production of fine and pleasing figures. As many as 30 alternate bars of iron and steel have been welded and rolled into a sheet which was then split into rods. These rods were twisted to form threads up to 18 to the inch. These in turn were made into strips and welded in tubes. The resulting figure was extremely fine. However, this extreme procedure was resorted to only when a very fine figure was the goal, and not a barrel of maximum strength.

It is evident from the history given that the welding of strips to form barrels was a practice used from very early times. Refinements came slowly and at great cost in effort. The advent of smokeless powder and, still more, the improvement of steelmaking and fabricating methods, signaled the end of an era of barrelmaking which had lasted 200 years.

Process doomed by its nature

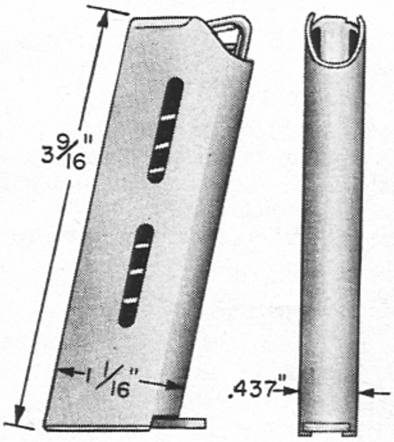
Probably the greatest single factor affecting the strength of the welded barrel was the inclusion of scale in the weld. This was known for many years and many precautions were taken to prevent it, but the process was doomed by its very nature and the lack of a suitable flux. Hammering the metal effectively worked the scale throughout the section, generally weakening it. Thus the finest 'figure', so highly esteemed, actually produced a weaker barrel due to the greater number of pieces welded, and the consequent greater inclusion of impurities.

These impurities were also a cause of pitting in the bore. Though most barrels with large inclusions visible in the bore surface were scrapped, many barrels with hundreds of smaller inclusions were used. Gradually the inclusions worked out, leaving small pockets to catch and hold residual salts from blackpowder. Moisture was picked up from the air and pitting developed unless the barrel was well cared for.—■

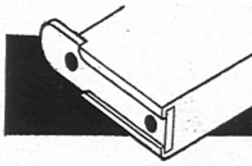
Bergmann Double-Action Special Model .32 ACP Cal.

PISTOL MAGAZINES

One of a series



Bergmann double-action pistols are not common but they are interesting. The Special Model was a contemporary of the Walther, Sauer, and Mauser double-action pocket pistols. While the gun contains a few novel features, it did not sell very well. Its mechanism does not seem rugged since it contains 13 wire springs. Another reason for its low sales appeal was its manual double-action mechanism. When the trigger is pulled, the hammer goes to full cock and stays there until the trigger is released and pulled again. While this makes for safer and more accurate shooting, it slows down the psychologically-important first shot.



Bergmann magazines can be recognized by the 2 holes in the floorplate and by the way the magazine sides fold over to hold the floorplate. The floorplate is permanently fixed and should not be removed. The long observation slots in the right-hand side also identify the magazine.

The magazine follower is made from a simple steel stamping and can be identified by the depression on the left front edge. This depressed area operates the hold-open latch when the last round is fired.—E. J. HOFFSCHMIDT