Twist Pattern Examples & Methodology

Stub Twist R. Williams, London refinished & browned by Paul Stevens

Identified names for "Twist"

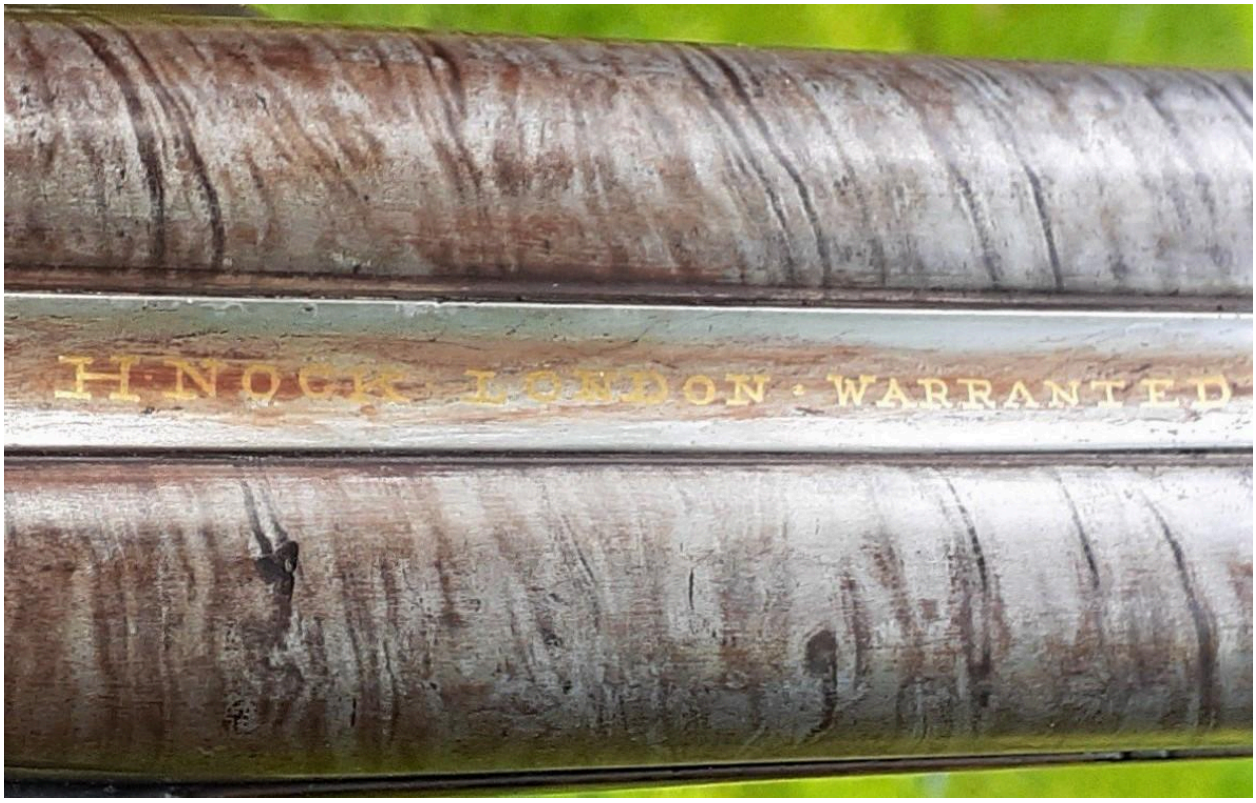
Twist damascus	*Canons tordus*
Wire twist	*Tors ou torches*
Stub/stubb twist /*Clou de cheval*	*Ruban tordu tin*
Stub damascus	*Ruban d'acier*
Plain twist/Skelp/Scelp	*Ruban moiré*
Twopenny/Wednesbury Skelp	*Ruban anglais*
Threepenny Skelp	*Lutticher Crolle*
Band	*Stahlband*
Banded damask	*Bamdnak*
Birmingham	*Vraì Ruban* (Real Twist)
London Twist	*Pointille Twist*

Ribbon damascus/*Damas Rubans, Rubans Fin, Rubans Royal*

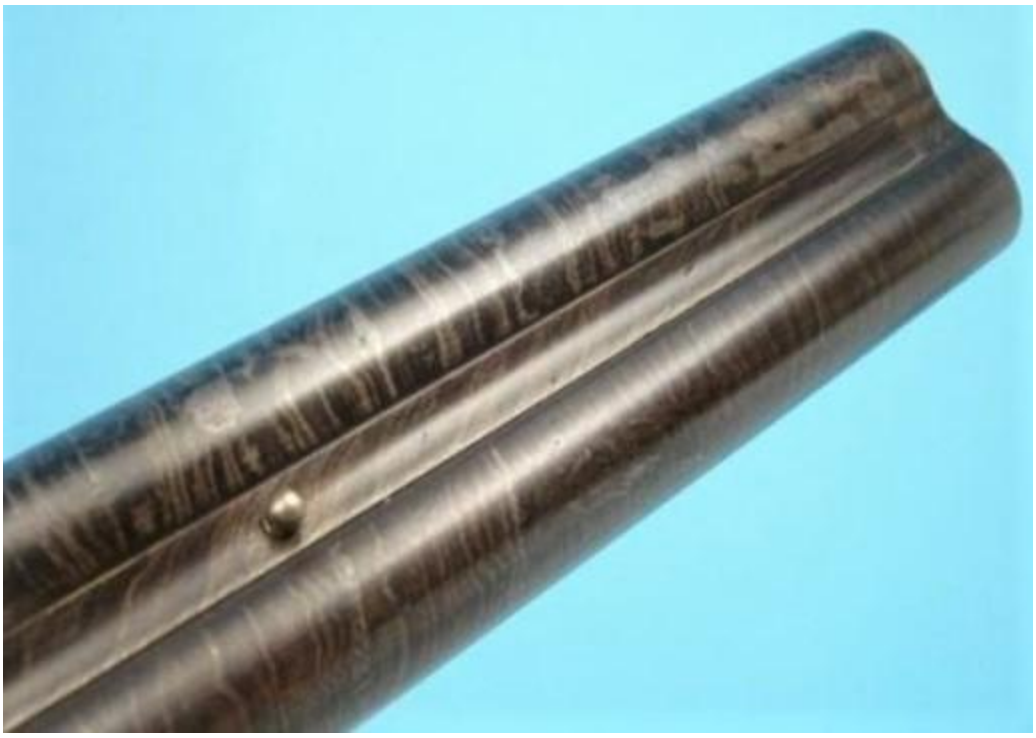
From “Making Damascus Barrels” by Jean Puraye in the April 1976 *American Rifleman*:

It was during the closing years of the 18th century that Western gunmakers began to use a mixture of iron and steel for making barrels. All their barrels were of twist damascus... In France, Jean-Francois Clouet (1751-1801) was probably the first to introduce damascus. Clouet was familiar with industry in and around Liege and had been in touch with iron foundries in the region of Franchimont. On 26 July 1794, he urged the armaments section of the Committee of Public Safety to employ workmen from Liege at Daigny and train them in the manufacture of arms and munitions. The link thus forged between Clouet and a few Liegeois workmen may have initiated the latter into the technique of damascus work. An Englishman, William Dupein, experimented with the process in 1798. In 1806 another Englishman, J. Jones, patented a new method of making gun barrels by turning a bevel-edged band of metal in a spiral about a mandrel, each turn overlapping and welded to the preceding one.

c. 1780s Henry Nock, London 20b flintlock with “Fine Twisted Stubbs”



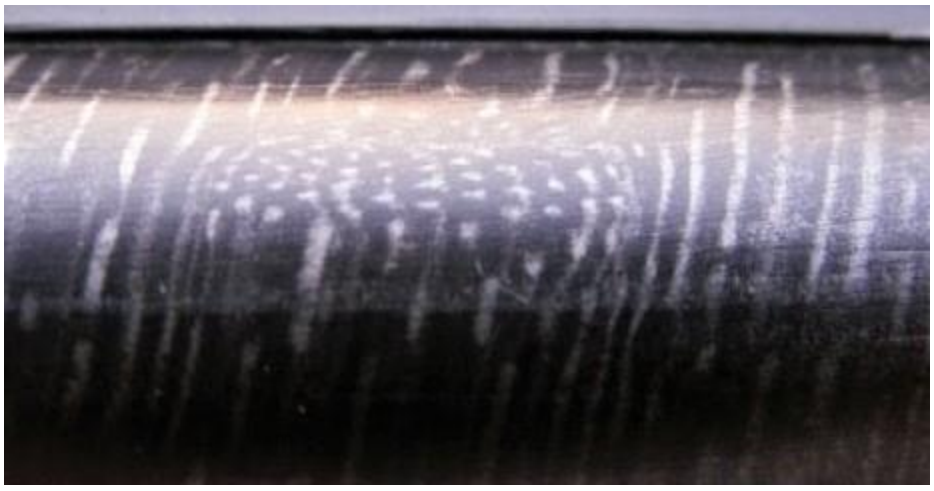
c. 1830s B. Heuseux of Liege flintlock double barrel shotgun



Richard Akehurst *Game Guns and Rifles*, 1969
Wilkinson and Son, at the Great Exhibition of **1851**, showed a series of exhibits demonstrating the forging of barrels and including **Damascus twist** made from 21 alternate bars of iron and steel which were then welded, drawn out by rolling to a square rod, twisted and then flattened; two or three rods were then welded together, wound round a mandril and forged as before. They also showed a specimen composed of two bars of 48 alternations of iron and steel, a specimen called **"chain twist"**, and called **"steel Damascus"** and a finished barrel composed of **seven different kinds of twist.**

Dr Gaddy: "Twist barrels are made from a single laminated blade of iron and steel (thin strips of iron and steel in a 1:1 ratio hammer welded together) then wrapped around a mandrel and hammer forged. They have a helical or spiral pattern of lines like a candy cane."

A **Plain Twist** rod seen end-on demonstrating the thin ribbons of iron and steel which are 'piled' to form the billet, which is hammered or rolled to form a single flat rod. In English scelp barrels, the strips of iron are twice the thickness of the steel.
Rods were then wrapped around a mandrel. Two or three were usually required to finish the barrel, the thicker at the breech. About 7 feet of rod, which was **NOT** twisted, was required for 1 foot of barrel.



William Greener, ***The Gun, or a Treatise on the Various Descriptions of Small Fire-Arms,*** 1835
http://books.google.com/books?id=oIEY4qL6_z0C
The mode of making the bar of **Wire-Twist** is this:— Alternate bars of iron and steel are placed on each other in numbers of six each; they are then forged into one body or bar; after which, if for the making of wire-twist barrels, they are rolled down into rods of 3-8ths of an inch in breadth, and varying in thickness according to the size of the barrel for which they are wanted. When about to be twisted into spirals for barrels, care must be taken that the **edges of the steel and iron shall be outermost**, so that when the barrel is finished and browned, it shall have the appearance of being welded of pieces the size of wires, the whole length of the barrel.

CAUTION

1881 H & D Folsom catalog with **"Imitation Twist"**

English Muzzle Loaders, made by Enos James & Co.

No. 8. Twist B. A. Locks, Oiled Stock, Checkered Grip, Best Quality..... $12 00
" 9. Twist Bar Locks, Oiled Stock, Checkered Grip, Best Quality..... 13 50
" 9X Twist Bar Locks, Oiled Stock, Checkered Grip, Best Quality, 9¼ to 11 lbs..... 15 75
" 10B Twist Bar Locks, Oiled Stock, Checkered Grip, and Fore End, Screwed Steel Escutcheons, Rounded Shoulders and Bands..... 15 00
No. 10XB Same as 10B, but 9¼ to 11 lbs..... $17 25
" 12B Laminated, Bar Locks, Checkered Grip and Fore End, Screwed Steel Escutcheons, Rounded Shoulders and Bands..... 18 00
" 12XB Same as 12B, but 9¼ to 11 lbs..... 20 50
" 13B " " 12B, but Box Furniture and finer. ... 20 25
" 13XB " " 12XB, " " " " 22 75
Extra for 10 Bores, $1.00. Extra for 38 and 40 inch Barrels, $1.50.

Belgian Double Guns, Best Make.

3150 Plain Breech, Imitation Twist, Good..... $6 75
3250 Patent " " " " 8 25
3250½ " " " " Black Stock..... 8 25
3207 " " " " " better qlty. 9 00
3206 " " " " Better quality..... 9 00
3201 " " Wire " " " 9 00
3222 Bar Lock, Patent Breech, Black Stock..... 10 00
22 Bar " " " Wire Twist, good quality. 10 75
3303 Twist B. A. Lock, English Finish..... 11 25
25 " Bar " " " 12 75
3803½ Superior Twist, Bar Lock, Pistol Grip, Checkered Grip and Fore End, English Finish..... 15 00
Rifle and Shot Laminated B. A. Locks, Good..... 19 50
" " " Bar " " 22 50
Extra for 36 and 38 inch Barrels on Belgian Guns..... 1 50

Cheaply made Belgian guns with Twist barrels, frequently with British-sounding names may be labeled "Laminated Steel" or "Untwisted Damascus."

"John Buckingham, London" with Twist barrels and Belgian proof marks

Low quality Belgian gun with “Fine Stubb Twist”

The REAL STUFF!

Walter Clement, Belgium “Laminated Steel”

Crescent “Genuine Laminated Steel”

ENGLISH SKELP

Skelp comes from the 1350-1400 Middle English **S*helpen:*** "To beat; a slap, smack, or blow, esp. one given with the open hand."
Crolle - Crullen are also Middle English words: "To form into coils or ringlets. Twist."
c. 1800 the word **Skelp** (sometimes spelled **Scelp**) was used in the pipe making process in reference to iron or steel rolled or forged into narrow strips and made into pipe or tubing by being bent and welded.

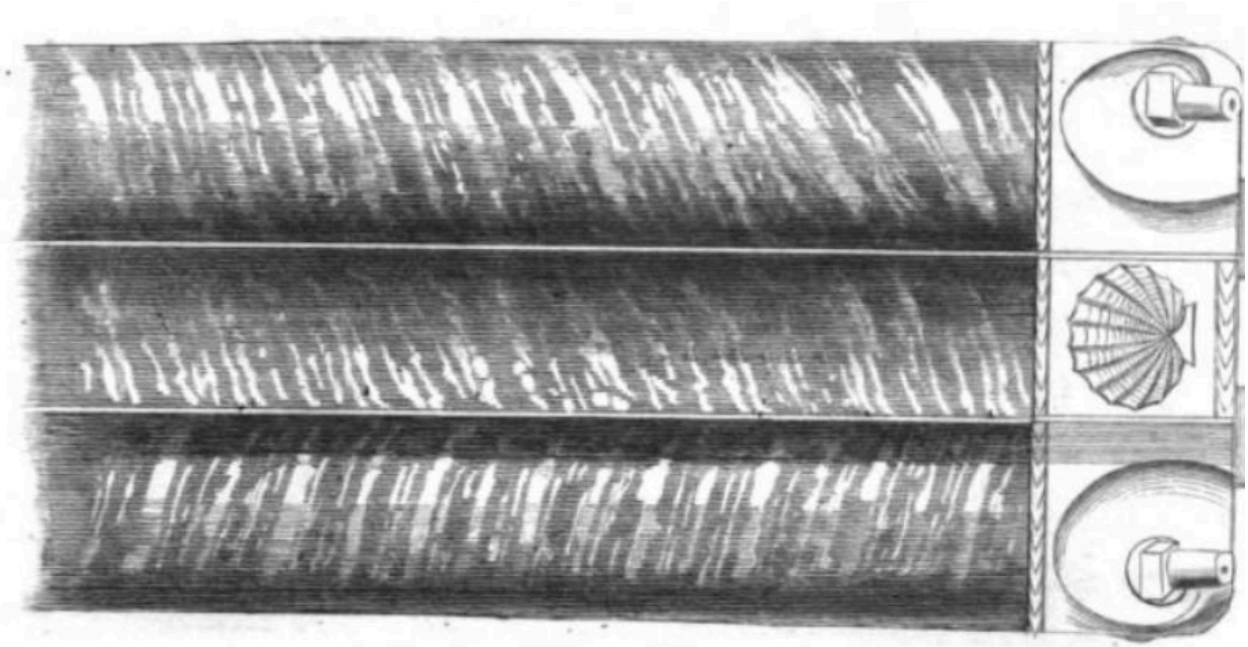
http://www.madehow.com/Volume-5/Steel-Pipe.html
In **1815**, William Murdock invented a coal burning lamp system. To fit the entire city of London with these lights, **Murdock joined together the barrels from discarded muskets.** He used this continuous pipeline to transport the coal gas. When his lighting system proved successful a greater demand was created for long metal tubes. To produce enough tubes to meet this demand, a variety of inventors set to work on developing new pipe making processes.
An early notable method for producing metal tubes quickly and inexpensively was patented by James Russell in **1824**. In his method, tubes were created by joining together opposite edges of a flat iron strip (**the Skelp**.) The metal was first heated until it was malleable. Using a drop hammer, the edges folded together and welded. The pipe was finished by passing it through a groove and rolling mill.

Appleton's Dictionary of Machines, Mechanics, Engine-work, and Engineering, 1873
http://books.google.com/books?id=zi5VAAAAMAAJ
Gun Barrels
http://books.google.com/books?id=zi5VAAAAMAAJ&pg=PA936&d
The first process in the manufacture of musket or **common barrels** is the making what are technically called **skelps**. The **skelp** is a piece of iron about one foot long, but thicker and broader at one end than at the other; and the barrel of a musket is formed by forging out such pieces to the proper dimensions, and then folding or bending them round into a cylindrical form until the edges overlap, so that they can be welded together. It is then placed in a furnace, raised to a welding heat, and taken out, when a triblet or cylinder of iron being placed in it, it is passed quickly through a pair of rollers. The effect of this is, that the welding is performed at a single heating, and the remainder of the elongation necessary for bringing it to the length of a musket-barrel is performed in a similar manner, but at a lower temperature.

William Greener, ***The Gun, or a Treatise on the Various Descriptions of Small Fire-Arms, 1835***
http://books.google.com/books?id=oIEY4qL6_z0C
Greener described 9 different gun barrels at that time:

1. Damascus from only two sources: Mr Clive of Birmingham and George Adams of Wednesbury (introduced about 1820)

2. Wire-Twist Iron (**later referred to as Skelp or Plain Twist**)
3. Stub-Twist Iron - Made from a 1:1 ratio of horse-nail stubs (iron) mixed with chopped coach spring steel, fused ("puddled") into a "bloom of iron", then hammer forged or rolled into a rod NOT twisted, which was then wrapped around a mandrel and hammer welded. He later describes "Stub Damascus" as Stub Twist rods which ARE twisted then hammer forged into a ribband.
4. Mr Wiswoulds Iron Barrels and a similar product called Silver Steel. These are described as 3/4 steel and 1/4 iron and from the description may be early Two Rod "Laminated Steel"
5. Charcoal Iron (without steel) – inferior to Stub-Twist
6. Threepenny **Skelp** Iron
7. Twopenny/Wednesbury **Skelp**
8. Sham Damn **Skelp** which apparently was stained to look like Wire-Twist
9. Swaff Iron Forging made up from small scraps of lockplates and gunscrews



STUB TWIST BARRELS.

Greener on **Stub-Twist**
Before proceeding to manufacture them into iron, women are employed to sort and examine each stub, to see that no malleable cast iron nails, or other impurities, are mixed with them. They are then taken and put into a drum resembling a barrel churn, through the centre of which passes a shaft, that is attached to the steam

engine which works the rolling mill, bellows, &c. When the machine is set agoing, the stubs are rolled and tumbled over each other to such a degree, that the friction completely cleanses them of all rust, and they come forth with the brightness of silver.
The steel with which they are mixed (being generally coach springs) after being separated and softened, is clipped into small pieces, corresponding in size to the stubs, by a pair of large shears, worked by steam. These pieces are then, like the stubs, put into the drum, in order to be divested of any rust they may retain, and are subsequently weighed out in the proportion of 25 lbs. of stubs to 15 of steel, in quantities of 42 lbs.
After being properly **mixed together**, they are put into an air furnace and heated to a state of fusion, in which state they are stirred up by a bar of the same mixture of iron and steel, until by their adhesion they form a ball of apparently melting metal. During this process the bar has become sufficiently heated to attach itself to the burning mass, technically called a **bloom of iron**, and by its aid the whole is removed from the furnace to the forge hammer, by which it is reduced down to a bar of iron, now about 40 lbs., the weight lost being wasted in the process of welding and hammering. From the forge it passes to the rolling mill, where it is reduced to the size wanted.

Henry Wilkinson, M.R.A.S., ***Engines Of War: or, Historical and Experimental Observations on Ancient And Modern Warlike Machines And Implements, Including the Manufacture of Guns, Gunpowder, and Swords with remarks on Bronze, Iron, Steel, &c.,*** **1841**
Part III On The Manufacture of Fire-Arms, And Modern Improvements.
http://books.google.com/books?id=0XJeF_oa3SMC&dq=engines+of+war+henry+wilkinson&printsec=frontcover&source=web&ots=NvGtJDbWo4&sig=nQ6-XPIcyp0N3CybdKxHmw3u60I#PPA70,M1
The most approved modern method of converting…(horse-shoe nails)…into (**Stub-Twist)** gun-barrels after carefully sorting and picking the, to see that no cast-iron or impurities are mixed with them, is first to put about half a hundred weight into a large cast-iron drum or cylinder, crossed internally with iron bars, through the centre of which a shaft passes, which is connected by a strap with a steam-engine, and the revolution of the drum actually polishes the nails by their friction against each other; they are then sifted, by which every particle of dust is removed. The steel intended to be mixed with them is clipped by means of large shears, worked by the engine into small pieces, corresponding in size to the stubs, and afterwards cleansed by a similar process. About 40 lbs. are thrown on to the

inclined hearth of an air-furnace, where they are **puddled** or **mixed together** with a long iron rod, and withdrawn in a mass called a **bloom**, almost in a state of fusion, to be welded under hammer of three tons weight, by which it is formed into a long square block: this being put in, at another door of the same air-furnace, is raised to a bright red heat, and drawn out under a tilt hammer of a ton and half weight, into bars of proper size to pass the rollers, by means of which it is reduced to rods of the required size.

For the finest barrels, a certain proportion of scrap steel, such as broken coach-springs, is cut into pieces and mixed with the iron by the operation called **puddling**, by which the steel loses a considerable portion of its carbon, and becomes converted to mild steel, uniting readily with the iron, and greatly increasing the variegation and beauty of the twist. In whatever manner the iron may be prepared, the operation of drawing it out into ribands for twisting is the same. This is effected by passing the bars, while red hot, between rollers until extended several yards in length, about half an inch wide, and **varying in thickness** according to whichever part of the barrel it may be intended to form. These ribands are cut into convenient lengths, each being sufficient to form one-third of a barrel: one of these pieces is made red hot and twisted into a spiral form, by placing on end in the prong of an iron rod, which passes through a frame, and is turned by a handle, the riband being prevented from going round without twisting by means of an iron bar placed parallel to the revolving rod. The spiral thus formed is raised to a welding heat, and dropped onto a cylindrical rod, which being struck forcibly on the ground (called **jumping**) the edges of the spiral unite, and the welding is then completed by hammering on the anvil. The other spirals are added according to the length of the barrel, and the forging is finished by hammering regularly all over. The ends of the spirals should be turned up and united at each junction of spirals, to avoid the confusion in the twist occasioned by merely dropping one spiral on another; but this is rarely done.

Wire-Twist, of any degree of fineness, may be obtained by welding alternate laminae of iron and steel, or iron of two qualities, together; the compound bar thus formed is drawn into ribands, and twisted in the same manner as the preceding.

George Ripley, Charles Anderson Dana, ***The New American Cyclopaedia: A Popular Dictionary of General Knowledge,*** **1859**
http://books.google.com/books?id=kL9PAAAAMAAJ

The commonest kinds of guns use tubes, formerly made by turning over a flat strip of iron called a **skelp,** about 3 feet long, 4 inches wide, somewhat thicker and broader at one end than the other, and lapping the 2 edges for welding. The **skelps** were forged and welded by hand, but this is now sometimes done by rolling, and

the barrel is drawn out to its required length as it is welded in the rolls from an original cylinder about one foot long; or, as the most convenient way of obtaining greater thickness at one end than the other, two tubes are employed for each barrel, and the thinner is inserted into the thicker, one end of which is opened out for the purpose, and then the two are welded together.
Bars for iron barrels are prepared by the process of **piling**. The selected pieces or scraps are first clipped into bits of the size of stubs, then washed with water, and cleaned from rust with acid; they are next placed in a revolving drum and rolled until they become bright as silver, when they are piled and heated almost to fusion; the ball (the **bloom**), weighing from 40 to 50 lbs., is hammered, and then drawn down to the required size in the rolls.
The bars thus obtained may be used in a great variety of ways according to the kind of barrel to be made. They may be turned up longitudinally to form **plain barrels**, the grain of which runs **lengthwise** with the tube; or coiled in a spiral around an iron rod used as a core, and thus form when the whole is welded together the **stub twist**, the grain of which follows the **spiral**; or they may be piled up, 6 bars alternately with as many of steel, and the whole be then forged into one, and rolled into (flat) rods 3/8 of an inch wide, which coiled in a spiral produce the **wire twist** barrel; or into rods 3/8 of an inch **square** for being converted into **Damascus** iron.

John Henry Walsh (Editor of "The Field"), ***The Modern Sportsman's Gun and Rifle: Including Game and Wildfowl Guns, Sporting and Match Rifles, and Revolvers,*** **1882**
http://books.google.com/books?id=OLwUAAAAYAAJ
"CONSTRUCTION OF THE GUN"
http://books.google.com/books?id=OLw...cad=0#PPA83,M1
Whatever may be the kind of gun about to be made, the first thing done is to forge the tube or tubes containing the charge. Formerly they were all made of plain iron, but for the last hundred years the barrels of all best guns have been constructed either of strips or twisted iron coiled spirally round a mandril, and welded together by heat, or of steel. At present the selection is from three kinds, viz., first, Damascus; second, laminated steel; and third, plain steel.
The chief difficulty in the present day is to obtain iron of sufficiently good quality to mix with the steel, whether for Damascus or laminated barrels. ***Formerly horseshoe stub nails were alone thought good enough; but of late years these have fallen off in quality, and are also insufficient for the supply of the increased demand for shot guns since the passing of the present game law.*** These stubs, generally mixed together with other "scraps," were welded together and forged into bars; but in the present day new iron is alone used, selecting the best quality in the

market, and refining it by melting and puddling, after which it is submitted to the tilt hammer, by which its fibres are condensed and drawn out.

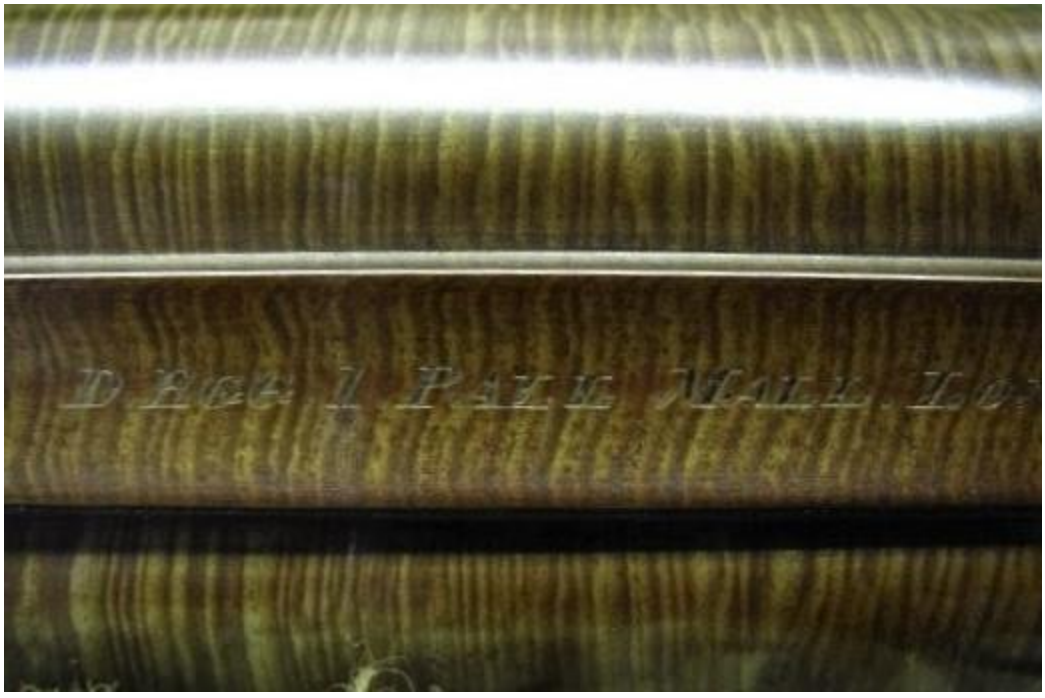
Dr Gaddy's English Twist, Plain Twist, Common Twist, Birmingham, or "Scelp/Skelp"
Referred to as "**Wire Twist"** by W. Greener in 1835.

The "English" does not necessarily indicate the country of manufacture.

Parker "Fine English Twist"

Stub Twist

Durs Egg refinished by Paul Stevens



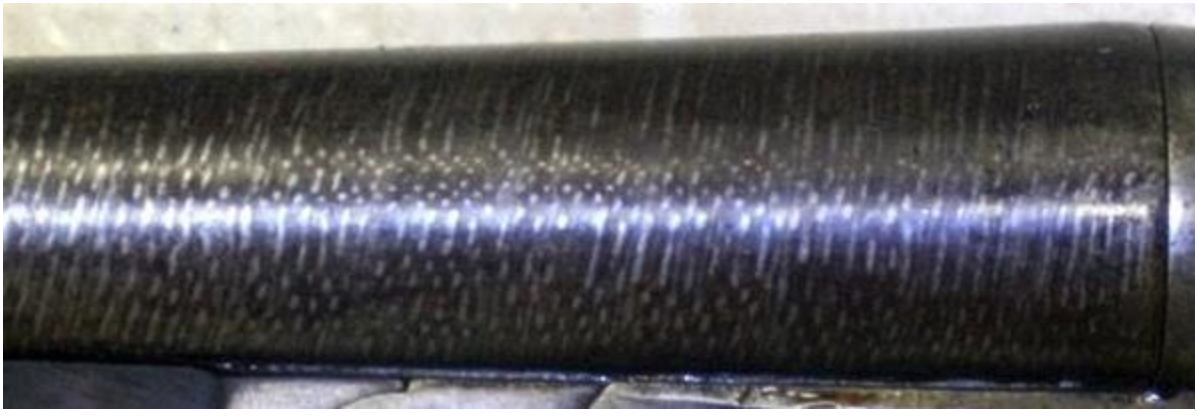
“Laminated Best Stub Twist”
c. 1870s Charles Green, Rochester New York percussion conversion

Belgian Twist or *Damas Rubans* (Ribbon)

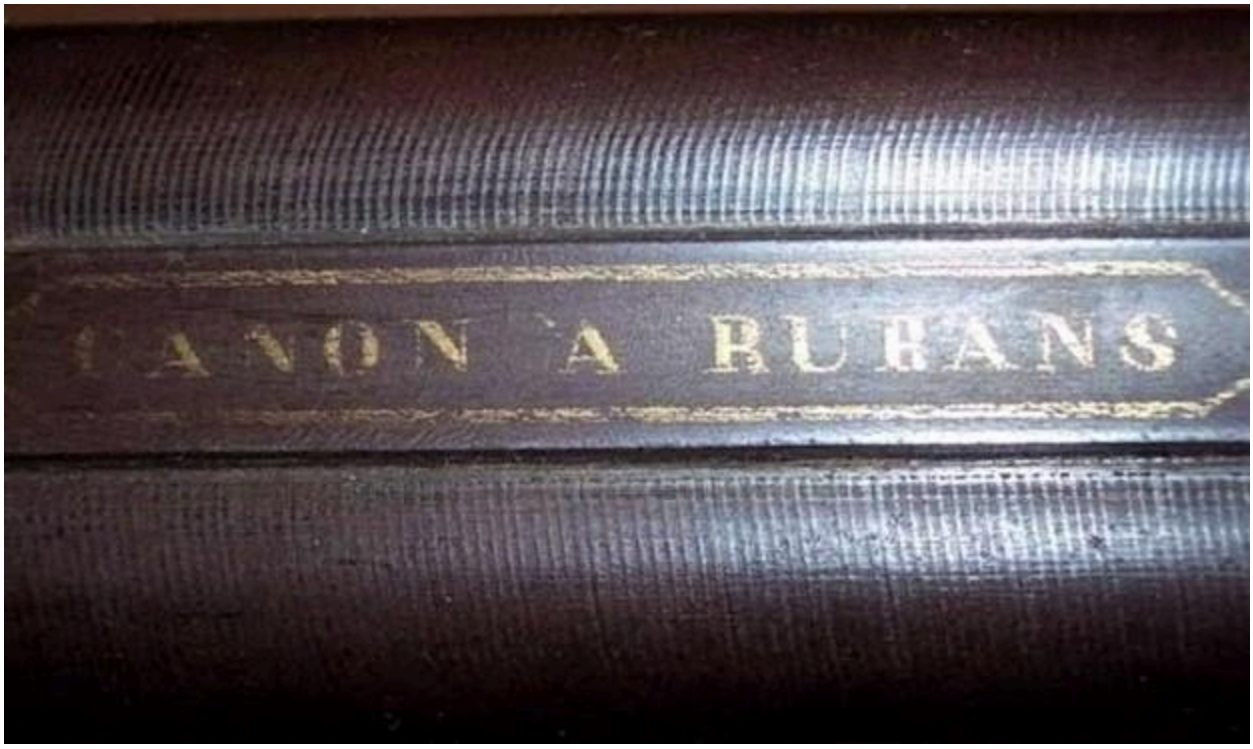
Belgian Twist barrels were used on Lefever H Grade, Parker PH Grade, Ithaca Grade One, and 1895-1899 LC Smith 0 Grade guns.

Dr Gaddy’s example

The Sears 1908 catalog described the pictured barrels of this Meriden shotgun as **“improved Liege full finished twist”** and when ordered as an upgrade on this hammer gun the shotgun cost the customer $13.59, $1.00 more than the gun with “fluid steel.” The same shotgun with the higher grade Liege “double blade Damascus” was priced at $16.59.



Canon 'a Rubans



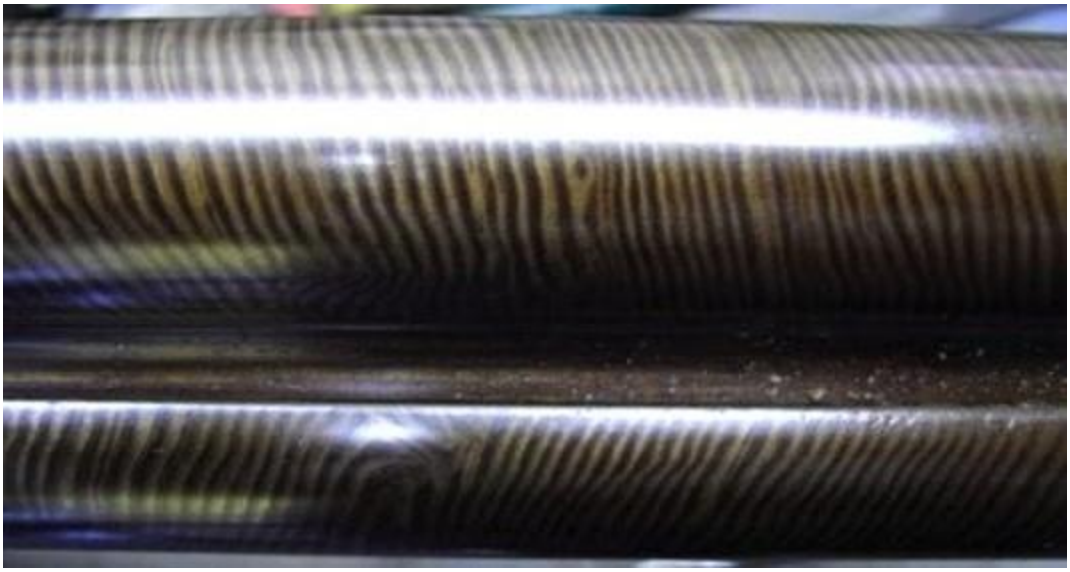
Andrew Ure, ***A Dictionary of Arts, Manufactures, and Mines: Containing a Clear Exposition of Their Principles and Practice,*** **1844**
http://books.google.com/books?id=lTIKAAAAIAAJ
The **Parisian** gun-makers, who are reckoned very expert, draw out the iron for the barrels at hand forges, in fillets only one ninth of an inch thick, one inch and a half broad, and four feet long. Twenty-five of these ribands are laid upon each other, between two similar ones of double thickness, and the bundle, weighing 60 pounds, bound with wire at two places, serves to make two barrels. The thicker plates are intended to protect the thinner from the violence of the fire in the numerous successive heats necessary to complete the welding, and to form the bundle into a bar two thirds of an inch broad, by half an inch thick; the direction of the individual plates relatively to the breadth being preserved. This bar, folded upon itself, is again wrought at the forge, till it is only half an inch broad, and a quarter of an inch thick, while the plates of the primitive ribands are now set perpendicular to the breadth of the narrow fillet; the length of which must be 15 or

16 feet French (16 or 17 English), to form a fowling piece from 28 to 30 inches long. This fillet, heated to a cherry red in successive portions, is coiled into as close a spiral as possible, upon a mandril about two fifths of an inch in diameter. The mandril has at one end a stout head for drawing it out, by means of the hammer and the grooves of the anvil, previous to every heating. The welding is performed upon a mandril introduced after each heat; the middle of the barrel being first worked, while the fillets are forced back against each other, along the surface of the mandril, to secure their perfect union. The original plates having in the formation of the ultimate long riband become very thin, appear upon the surface of the barrel like threads of a fine screw, with blackish tints to mark the junctions. In making a double-barrelled gun, the two are formed from the same bundle of slips, the coils of the one finished fillet being turned to the right hand, and those of the other to the left.

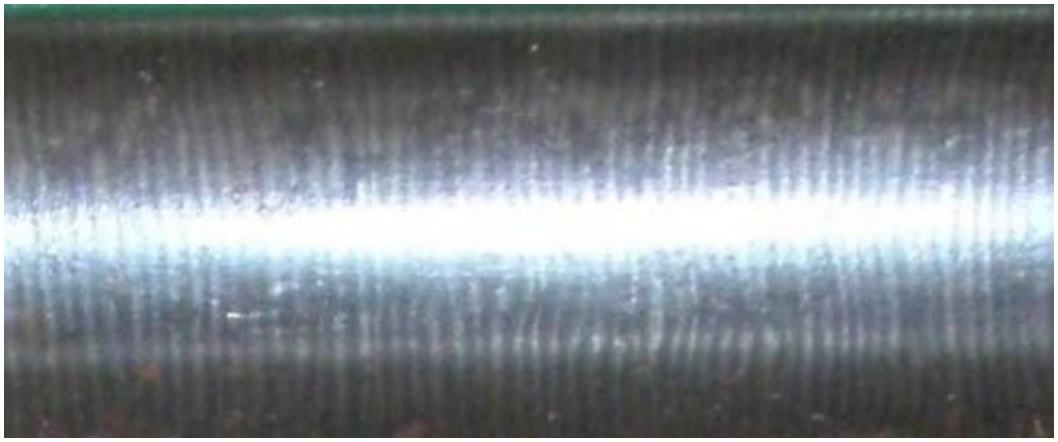
See http://docs.google.com/Doc?id=dfg2hmx7_162c3zhvkfx
1. Strips of iron and steel *l'acier de rive en ballons* are stretched with trip hammers to 28 mm. wide and 1.25 mm. thick.
2. The steel and iron strips are cut to a length of five feet then piled or faggoted with **19 *alternees* of iron and 20 *alternees* of steel,** placed alternatively: an iron *alternee*, a steel and so on. The top and bottom *alternees*, called *couvertes (*coverlet), have a thickness of 7 mm. so they can resist the heat and hammering of the forging mill. These pieces are hammer welded by "two good strikers."
3. When the ***lopin*** is welded perfectly, it is sent to the trip hammer, which stretches the rods to 3.5 mm. thick, as far as to two thirds of the length of ribband; for the last third, intended to form the strongest part or the *tonnère* of the gun (the breech?) the thickness was gradually increased to 9 mm.
4. Once the ribband is hammered to **4 - 5 meters in length and 51 mm. broad** it is folded around the *broche* (mandrel).
5. To make the barrel, it's necessary to wind the ribband around the *chemise* (sleeve.) The prong supporting the sleeve was connected with a type of hook placed near to the end of the sleeve; the thick end of the ribband, heated red-hot, was passed through the hook and all the red-hot part of the ribband was rolled onto the sleeve and hammer welded, then another part was heated and the rolling continued until the end was reached.
6. As this ribband was 4 to 5 meters long, the successive partial reheating engendered a very difficult operation until the forgers had the idea to **wind the ribband onto itself, in the form of a disc, starting at the little end.** Great care is taken not to twist the ribband so the edges will form the inner and outer surfaces of the finished barrel. In this manner, the ribband of 4 to 5 meters or 15 to 18 feet

long necessary to make a barrel, is reduced to disc with a diameter of 18 - 20 centimetres, or 7 - 8 inches, a size easy to heat and easy to roll with pincers.
7. When the rolling and hammer welding of the ribband is finished, the mandrel is pulled out and the sleeve remains inside the ribband. The smith dresses the ends of the ribband so that the two ends of the tube terminate evenly. Then, after inserting a plug of clay, each end is heated to weld the sleeve to the ribband. The sleeve will be drilled away when the tube is bored, straightened, and polished.

“Wire Twisted” - Likely French ***Canon a ruban de fer et d’acier***



Ferlacher Ruban or Fine Twist



Acid Etched Twist

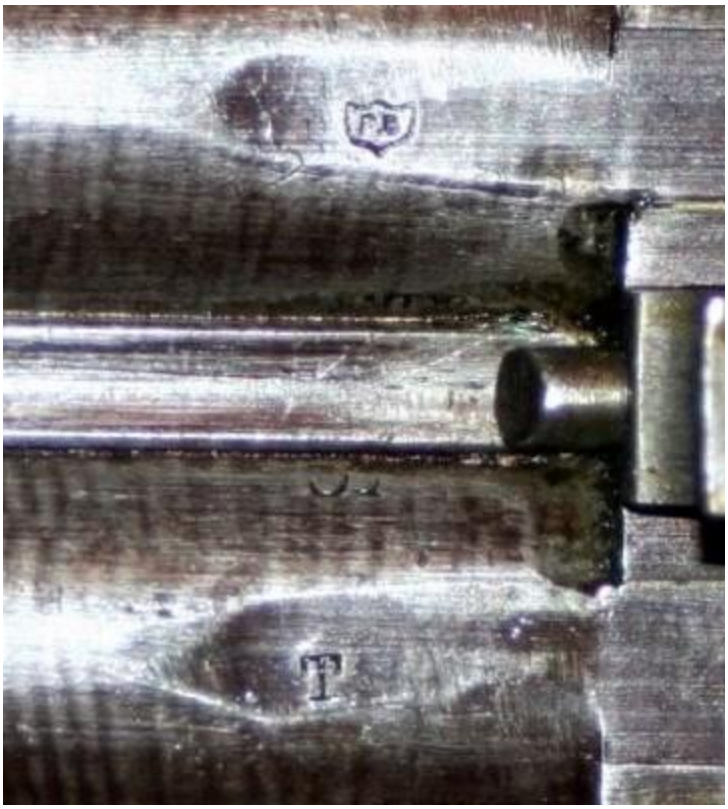
Possible American Twist

c. 1870, Parker offered ‘Plain Finish-Iron’ Barrel for $50, ‘Superior Finish-Iron’ Barrel for $75, and ‘Laminated Steel’ barrel for $100. The Parker-made barrels carried a special ‘PB’ mark. Some 1870s Parker Hammer Lifter guns are marked “Twist” on the rib, but are clearly Laminated Steel.

Letters in the Nov. 1878 *The Chicago Field* from Parker Brothers included statements that “We import largely both Laminated and Damascus, and also manufacture a very fine Laminated--as fine, we think, as any we have ever seen imported. We have made them about eighteen months.”

The Chicago Field on March 8, 1879 reported “The Parker Bros., of Meriden, Conn., **commenced making twisted barrels** in the Spring of 1877.”
See http://docs.google.com/Doc?id=dfg2hmx7_1742r4n6vcz

T1 Lifter with ‘PB’ in a shield, ‘T’ for Twist, and an unknown mark covered by the bottom rib. Courtesy of Ron Conover.



1875 16g O frame Hammer Lifter Parker courtesy of Dave Miles. Barrels have been refinished by Dale Edmonds but with little black-white contrast obtained, possibly related to the iron and steel sources.

Damascus Twist

Also called “London” and Baker “Best London Damascus Twist”. The edges of the Twist rods have been mushroomed by hammering.

Very similar pattern barrels are found on LC Smith Maker Baker, Parker top lever hammer P grade, H grade Lefever, and Baker Gun & Forging B grade guns.

A Twist pattern refinished in “black & white” by Paul Stevens with “mushrooming”. An “end on” rod in the middle.

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