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The potter's wheel and the bow-drill, both of which were in use in widely separated countries as long as 6,000 years ago, were the precursors of the machine-tools of today.

The earliest type of drill was the hand drill which consisted merely of a smooth cylindrical stick having at one end a pointed flint. To drill a hole the stick was rotated between the palms of the hand. This type of drill, but without the flint insert, was also the earliest known method of making fire.

Next came the strap-drill, which was the earliest mechanized form of drill. A thong or strap was passed around the middle of the drill and the drill was rotated by pulling the thong backwards and forwards. This method necessitated the use of two operators for, whilst one was pulling the thong the other had to press down upon and steady the drill by means of a socketed holder on top.



Inuit using bow drill with chin pressure to drill ivory.

In this, the thong was still used to rotate the drill, but the two ends of the thong, were attached to the ends of a bow and so enabled one operator to manipulate it. These two principles, that of the bow-drill and the strap drill, were later adapted to the lathe.

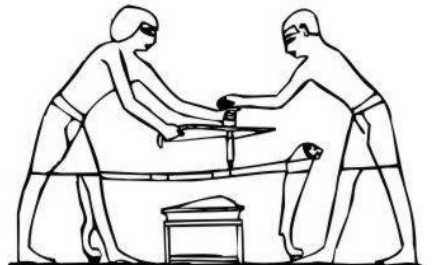
The bow drill is one of the oldest types of drills developed by craftsman. There is much evidence that it was widely used during the Egyptian times 3000 BC to drill holes in wood and stone. From the Old Kingdom we have illustrations which show

THE BOW DRILL By Bob Garay

carpenters were using bow drills to bore holes in timber. A number of carpentry bow drills have been found that were used by the ancient Egyptians. The bow

was much wider at one end to allow for a handhold, and the drill-stock was made of wood, and sometimes contained a discharge hole to help eject the drill bit. The capstone bearing was of wood or hard stone, and had a hole in one end for the insertion of the drill-stock. The first known depiction of the bow drill is in the 5th dynasty tomb of Ty at Saqqara; however, the tool must have existed earlier since a number of bored wooden objects exist from the Early Dynastic Period.

Hand-powered stone borers were also used by the ancient Egyptians for the hollowing of stone vases and representations are found in Egyptian art. The use of bow-powered coring drills as a method of cutting rock is inferred from marks observed on ancient Egyptian stonework, and includes pieces of waste rock, as well as finished and unfinished stone objects. Traces of verdigris, either copper or bronze, as well as abrasive, have been found in core holes in both Egypt and Crete.



Drawing of hieroglyphics found in Egypt.

Modern Bow Drills

The bow drill was a dominant boring tool until the invention of the brace during the Middle Ages. When it was used for drilling smaller holes in wood the top of the wood handle was pressed down with the operators hand. But when large holes was needed or drilling into tougher material like metal a breast plate was used allowing to operator to apply more pressure and even free

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Simple bow drill with detached top which fits a point at the top of the metal spindle.

up a hand to hold the work. Over the years a drill bit was developed which allowed cutting action to take place in both directions, thus improving the worker's efforts.

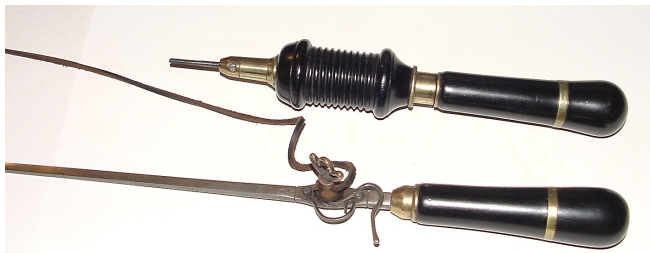


Bow drill with breast plate.

By the 1850's there were manufactured bow drills of the highest quality. Buck of England is one of the premier bow drills of this time. Their use of ebony wood, with finely machined internal spinning mechanisms, made them much desired by the finest craftsmen of the 19th century.

The Bow

Early bows of ancient resembled the hunting bow of the era. But over time it was modified to more closely resemble the fiddler's bow. Early versions were made of wood and easily fashioned by the user

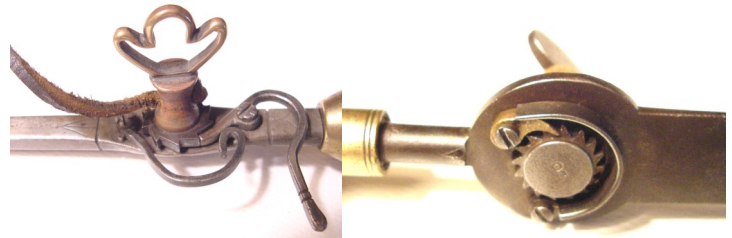


English ebony bow drill with matching bow. Marked on brass ring, G. Buck Maker, 242 Tottenham Court Road.

of the bow drill. The cord was just tied loosely in a knot thru a hole at each end. Later a metal sword like bow developed with a turned wood handle with the cord tied to a "S" bend on one end and tied to a metal hook at the handle end. During the 19th century many different ratcheting devises were developed to tighten the cord at the handle end. Today these intricate ratcheting bows are highly prized by the collector.

New York City Bow Drills

During the later part of the 19th century, there



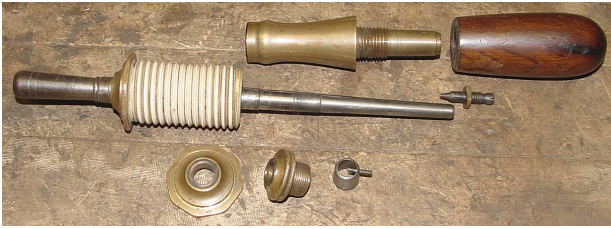
Two different ratcheting bows.

developed a tight-knit industry of craftsmen in New York City who made tools for the highly specialized trade of piano and organ builder. Most well known of these makers is Napoleon Erlandsen and his son Julius. Many examples of their bow drills exist today and are highly prized by collectors. Erlandsen was by trade a machinist and his drills were precision made. They had steel main shafts with ivory pulleys and rosewood handles. They were exquisitely machined and had a fine adjustment mechanism for fine tuning the spinning action to eliminate wobble. I have seen many of these and find they are often marked differently if at all. I recently acquired a bow drill with a rosewood pulley that was constructed similar to the Erlandsen's drills. I was astounded when I took it apart and found the mark, L.BRANDT, No 220 1/2 5T St. NY. Knowing Dominic Micalizzi's research on Brandt had him born in Denmark in 1808, this made him 23 years older than Napoleon Erlandsen. Domi-



Above top is drill marked R. Fishley, made similar to NY style drills. Second drill is stamped N.E., NY (Napoleon Erlandsen). Third from top is marked HS & Co. (Hammacher & Schlemmer). Bottom is drill marked L. BRANDT, No. 220 1/2 5t St. N.Y. (See close-ups below).

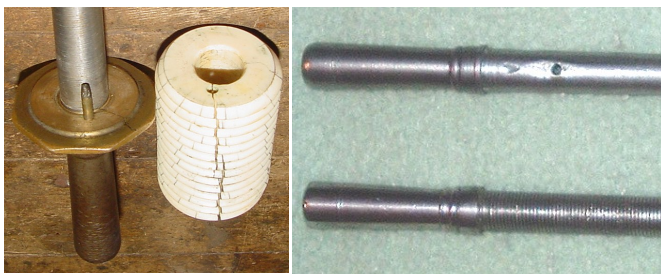




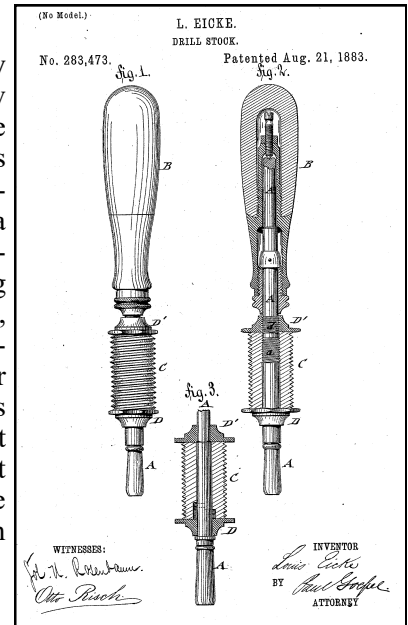
Erlandsen ivory pulley bow drill apart showing main parts. Note needle point adjuster at top of spindle. Usually this is the only part needing adjustment.

nic also researched his 1850 to 1860 address to be 220 1/2 5th St. Thus, this bow drill predates any Erlandsen drill by five years as Erlandsen was not listed in the New York City Directory until 1864. In the many years after 1865, both Brandt and Erlandsen shared working addresses. It would seem to me that Lauritz Brandt shared his drill making techniques with his younger fellow tool maker Napoleon Erlandsen. Although I have to admit that Brandt's bow drill exhibits more attention to the design details.

One of the problems bow drill makers faced was how to secure the spiraled ivory pulley to the spinning spindle. Taking apart some of Erlandsen's drills reveals four different techniques that were used. The simplest technique used was to press fit the ivory pulley tightly to the spindle while tightening the brass hexagon nuts securely on each end. This was easy but usually the pulley loosened and adjustments were needed. Another technique used a fixed pin in the brass octagon nut fitting into a matching hole in the ivory. A similar method was to have a fixed pin thru the main revolving spindle which secured in a groove notched inside the hole of the ivory pulley. Both of these pin methods secured the ivory pulley but often resulted in cracked ivory from the resulting stresses. A patent by New York inventor, Louis Eicke, in 1883 solved this problem by employing a threaded spindle which locked into internal female threads inside the ivory pulley. Erlandsen used this design in some of his drills and indeed these ivory pulleys tend not to crack.



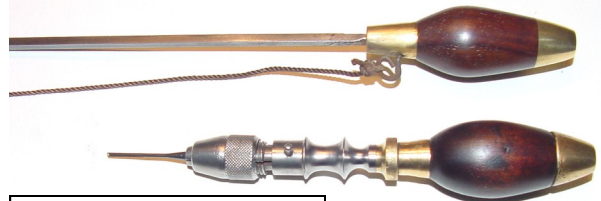
Left-fixed pin inserted in ivory caused stress crack. Top right spindle has hole for pin that fits internal groove in ivory. Bottom right shows spindle that is threaded to match internal threads in ivory pulley. See patent drawing .



L. Eicke patent No.283,473.

Part of the joy of collecting Bow Drills lies in the abundant varieties of beautiful designs. There is a multitude of possibilities regarding design, materials, size, and operational mechanics. For the collector who is also a craftsman, it is challenging yet rewarding to make a bow to match your finest drill.

Bow drills are one of mankind's first machines that has a long and important history. It would be lucky to find one in a flea market or garage sale. They show up often at tool auctions, and the best demand high prices. It seems rarer yet to find a ratcheting bow, never mind a matching set of drill and bow. Still the hunt goes on and I will welcome others to join me in collecting and enjoying this significant tool of our ancient times.



Matching bow with drill.



Above - A small jewelers bow drill. Right - A small bow drill with a rare cagehead design.