The development of the electric drill

By Neil Searle

One of the most critical developments in the history of power tools was the invention of the electric motor in the late 19th century; it was around 1856 when the first brushed DC motors were released. This technology made it possible to power tools using electricity rather than steam or other forms of energy. This was a significant breakthrough, as it meant the creation of smaller, more portable power tools that could be used in a wide range of applications.

TIMELINE

1889: Arthur James Arnot and William Blanch Brain, Melbourne, Australia, patents the handheld electric drill.

1895: Wilhelm & Carl Fein of Stuttgart, Germany invent the first portable electrical drill.

1910: One of the first in the USA to manufacture a drill, Temco Electric Motor Co.

1917: Samuel Duncan Black and Alonzo Galloway Decker, Baltimore, USA. Their invention combined a pistol grip and trigger switch into its design.

1961: The first cordless drill by B&D.

Arnot & Brain, Australia.

This is arguably the earliest patent for a handheld electric drill, though it stretches the definition of "handheld". The drill was intended for rock drilling and likely required two men to lift it. Co-inventor W. Blanch Brain was involved in coal mining, and he had earlier developed an explosive known as Brain's powder. Co-inventor Arthur Arnot was a Scottish electrical engineer who moved to Australia in 1889. He would play a key role in the electrification of Melbourne and seems to have connected with Brain as he tried to secure a reliable supply of coal for Melbourne's generators. They two men plus Arnot employee Frank Baker worked together to develop this drill. It is likely that Brain provided the requirements for a mining drill and Arnot designed the drill, especially the electrics. Baker's role is not known but he may have been involved in the mechanical design. This invention is often credited to "Brain and Arnot" with Baker not being mentioned; Baker is not listed on the Canada patent which further suggests that Baker was not being given much credit by the other two men.

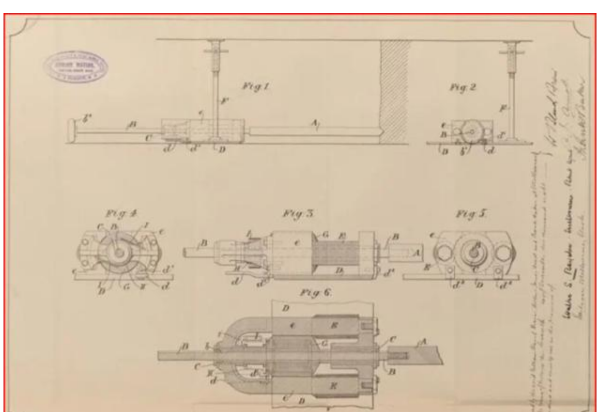


Fig. 1. Patent No. 1890000001 granted Aug. 20, 1889

Patented in 1889. Detail from Arnot's original patent filing for his electric drill. (Image: From the collection of the National Archives of Australia) It is not known whether this drill was manufactured and put to use, whether for use in Brain's mining operations, or more widely. (This according to DATAMP).

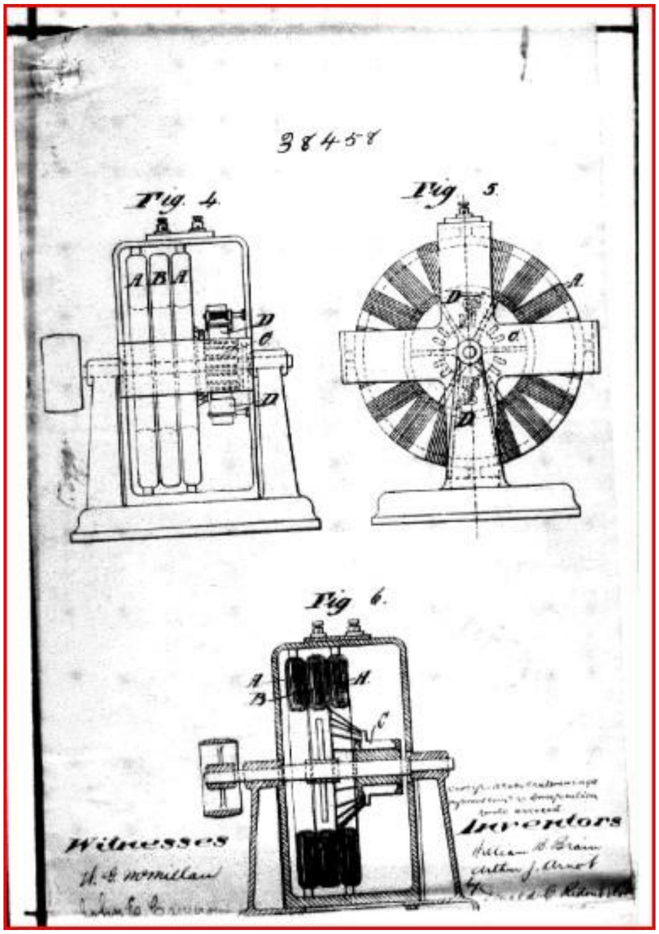


Fig.2. ALTERNATING ELECTRIC CURRENT MOTOR. Canadian Patent CA38458A. WILLIAM BLANCH **BRAIN** [AU]; ARTHUR JAMES **ARNOT** [AU] Oct. 03, 1892.

"The fact that they were using an early motor means it would probably have had brushes on it, so it would have produced sparks. If you're around any sorts of gases that are flammable, which are not uncommon in mines, then that presents another serious problem." Electrical cables were another obvious problem in mines.

The only solution to a motor throwing out sparks was to cover the motor compartment as much as possible without risking overheating.

On August 20, 1889, he along with mining engineer William Blanch Brain and Frank Baker patented the world's first electric drill, which they called "an improved electrical rock-drill, coal-digger, or earth-cutter." Although the patent clearly names all three men (in fact, Brain's name appears first), Arnot is usually given sole credit for the invention. Arnot also worked on refinements to the electric motor that powered his drill, and in 1891 he was granted a patent for an improved alternating-current (AC) motor.

No. 2321. July 11, William Blanch Brain, of Abernethy, Hotham-street, St. Kilda, near Melbourne, Victoria, Arthur J. Arnot, of Fink's-buildings, Melbourne, Victoria, and Frank Baker, of Byron-street, St. Kilda, near Melbourne, Victoria, for improvements in rock drills, coal diggers, or earth cutters.

No. 2325. July 11, William Blanch Brain, of Abernethy, Hotham-street, St Kilda, near Melbourne, Victoria; Arthur J. Arnot, of Fink's-buildings, Melbourne, Victoria, and Frank Baker, of Byron-street, St. Kilda, near Melbourne, Victoria, for an improved electrical rock-drill, coal-digger, or earth-cutter.

Fig. 3. Patents Office Transactions. *Applications for certificates of provisional protection and letters patent lodged from July7 to 12.* Vol. L, no. 1567. New South Wales, Australia. 19 July 1890. p. 146. National Library of Australia.

Also, William Blanch Brain, often referred to as W. Blanch Brain, was inventor of "Brain's powder", a powerful explosive. Also known to have invented a butter churn.

FEIN, Germany.

The first modern power tool was a combination of an electrical motor and a hand drill; the result was a heavy 7.5kg drill. German company C&E Fein, (Wilhelm and Carl Fein) , the inventors of first power tool, developed first version of its drill in 1895. The bulky drill required multiple operators and was very slow.

Fig. 4. Although this power drill was a cumbersome and difficult-to-use drill, it kept its superiority for the next 20 years until 1910. This drill can still be seen today at the Deutsches Museum in Munich.

The drill operator gripped handles on either side while pressing into the drill's chest plate to help the drill bit penetrate the work surface. At the time, small electric motors were just beginning to arrive in Germany from England. Fein and designer Otto von Kellenbach worked together to produce the world's first production electric hand drill. It weighed 16 1/2 lbs. and could drill through steel 0.1 in. thick.

Fig. 5 & 6. Fein Handheld grinder (Their website states "Handheld Sanding Motor") the power lead plugs into the top of the motor housing. Alongside is the Black & Decker handheld grinder with the pistol grip and trigger switch.

FEIN was not slow to recognize the potential of the new hand-operated power tool. In 1908, FEIN became a 'specialized factory for power tools'. Initial efforts focused on quickly improving the drill, giving it more power and making it more lightweight. The next power tool to follow was the portable grinding machine. Fein went on to introduce the first electric pneumatic hammer and then the reciprocating saw in 1927.

No. 197

Präzisions-Zweibacken-Bohrfutter, mit Schutzring und Schlüssel

Drill Chucks with 2 Jaws, with steel ring and key

Mandrins à 2 mâchoires, avec anneau en acier et clef

Mandriles de 2 mordazas, con anillo de acero y llave

Spannweite mm	0—6	0—10	0—13	0—16	0—20	0—26
inches	1/4	3/8	1/2	5/8	3/4	1
Gewicht . . . gr	400	700	750	1150	1900	3300

Fig. 7. From the Tool Catalogue of Lohmann & Co. Bremen, Germany. (Circa 1930s)

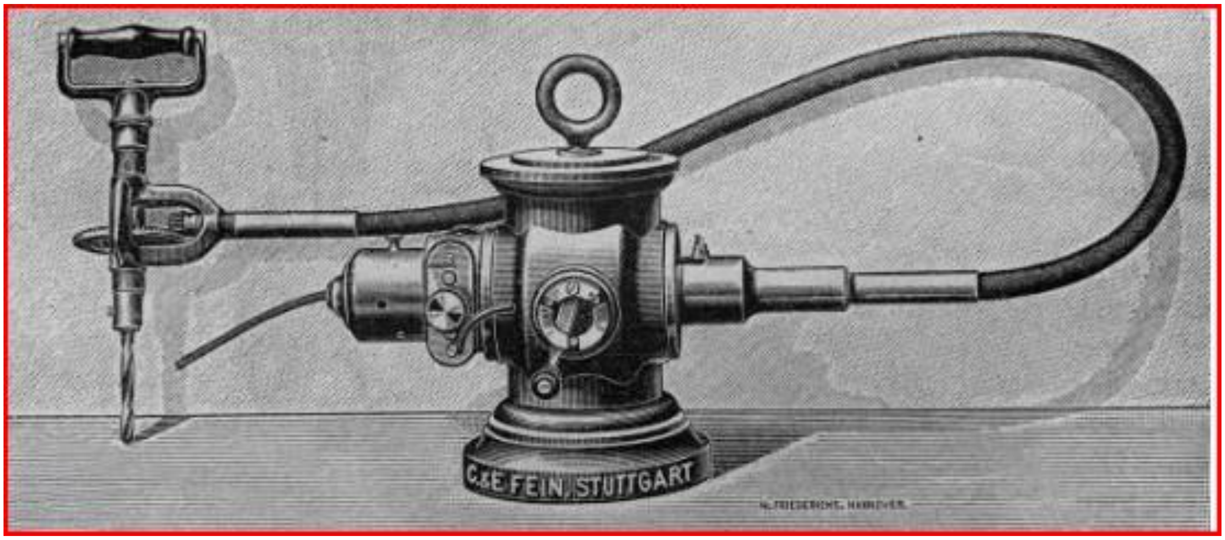


Fig. 8. A chain supported drill with a flexible lead by C&E Fein.

FEIN HISTORY

In 1867, Wilhelm Emil Fein founded a company to manufacture physical and electrical equipment where his son Emil Fein invented the first electric hand drill almost 30 years later in 1895. This invention paved the way for highly reliable power tools, which FEIN still manufactures at its site in Germany and for which the long-standing German company is known in industry and manual trades throughout the world to this day.

FEIN has been a world-leading power tool manufacturer for over 150 years and without a doubt one of the main reasons for this is that FEIN continues to meet its own standard of only developing durable power tools with every new product innovation it creates today.

Temco Electric Motor Co.

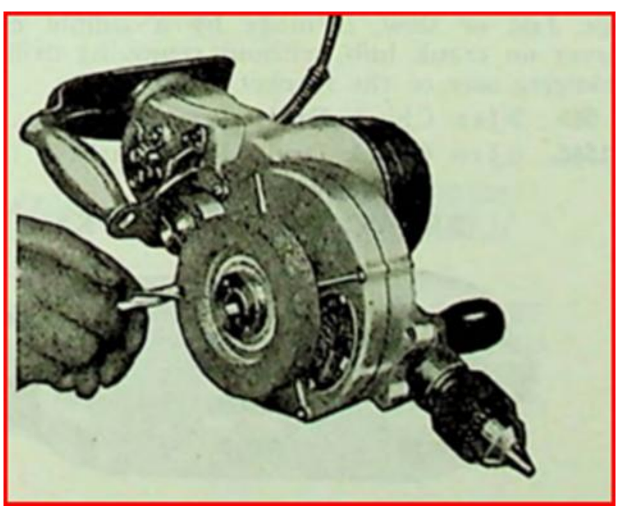
Fig. 9. The 1919 Model "B" electric breast drill made by the Temco Electric Motor Company, Leipsic, OH. USA. The drill is so old that it was made before electrical wall outlets were common and standardized.

Fig. 10. The chuck with its right angle feature. **Fig. 11**. The motor was at right angles to the axis of the drill.

Fig. 12. The on/off switch. Despite these early experiments, electric motors were not widely used for commercial purposes until the late 1880s. This was primarily due to the need for a reliable power system, which was not yet available.

Fig. 13. Notice the plug for the light socket, one may then need to light a candle to see…? Regarding the claim, DC and AC, most motors cannot, however certain electric motors, known as universal motors are capable of dual operation.

When it is desired to tighten the drill chuck, the spindle can be locked against rotation by swinging it to a right angle position where it is locked by jaws on the main frame.



The emery wheel attachment is a feature, for the drill which is used may be sharpened on the emery wheel. Thus the repairman working on the car may sharpen the drill without walking the length of the garage to the stationary emery wheel.
By the attachment of the proper tool the Temco instrument may be used also as a valve grinder.

Fig. 14. Catalogue listing where Temco offered a grinding wheel attachment for sharpening drill bits as well as a valve grinding attachment. From "Motor Age" Magazine 1913.

Black & Decker

In 1910, a tool and die worker by the name of Duncan Black sold his car for $600 and used the money to start a small machine shop in Baltimore, Maryland with his friend Alonzo Decker. In 1914, the two arrived at the same idea to improve the C&E Fein power drill by adapting the design of the Colt .45 automatic pistol. By 1916, Black & Decker had begun making their famous pistol-grip, trigger-switch electric drill, from which all modern handheld electric drills are descended.

Fig. 15. Advertisement showing the idea of the trigger and the Colt Peacemaker hand gun.

The Black & Decker drill was not only lighter, but it used a more powerful motor and could be easily operated by one person, two critical features missing from C&E Fein's original electric drill. After that, the power tool industry was off and running and Black & Decker was soon followed by new companies with new kinds of power tools. A new era of human productivity was born.

"This type of tool as we know it today. They originated on the American continent in the 1920s, at the Black & Decker factories. It was there that the now famous pistol grip was created, which allowed for comfortable and easy operation."

New developments made power tools lighter and more efficient in the next years. But the improvements were not just in these aspects, power tools also changed from the safety point of view a lot. Before the thirties, power tools were cased in metal housings. This metal housing often led to injuries and electrical shocking during work. After using different materials and so many trial and errors, it was Bosch that offered the first plastic body power drill in 1957.

However, again it was Black & Decker that fabricated the first cordless power tool in 1961. Later in 1915, Makita Electric Works is born.

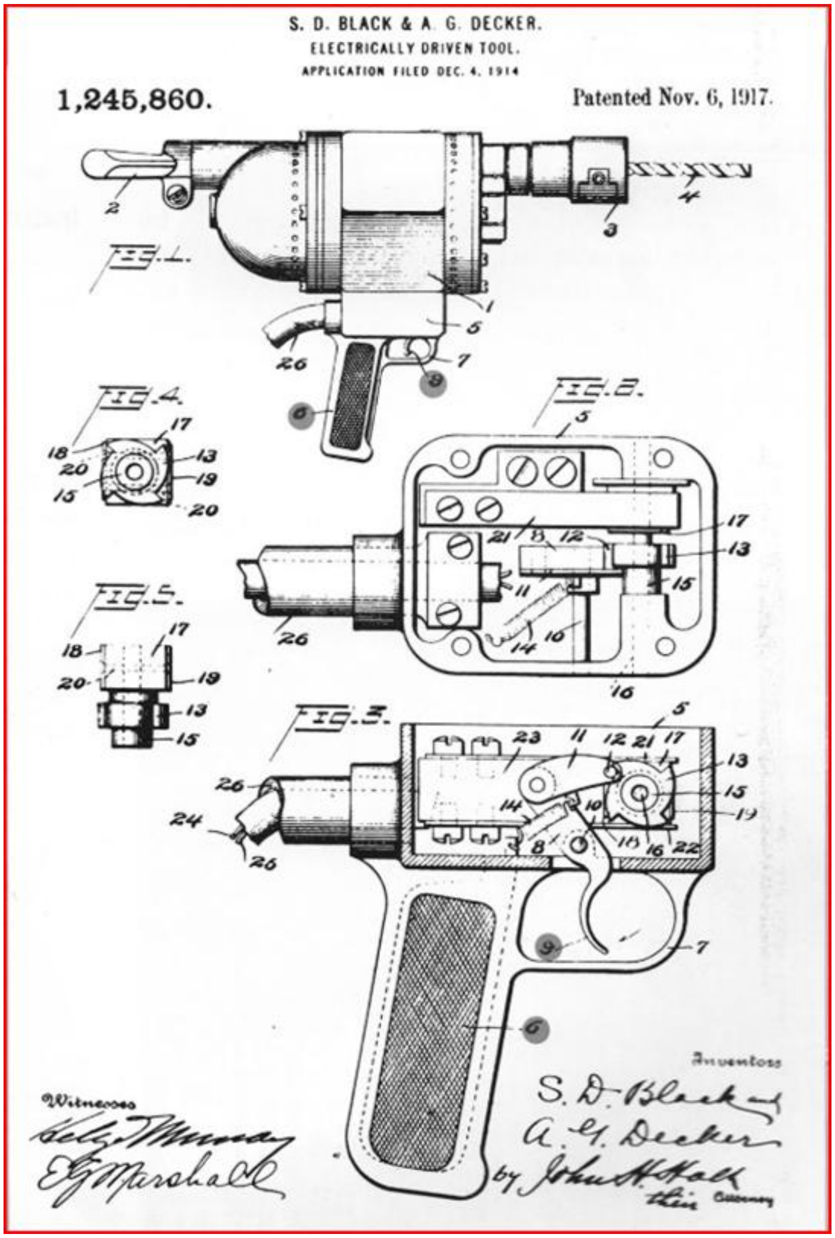


Fig. 16. S. D. BLACK & A. G. DECKER. Electrically Driven Tool. Patent 1245860 Nov.6, 1917

A Colt handgun inspired them to design the first drill with a similar feature……. In 1910, S. Duncan Black and Alonzo Decker established a machine shop in a Baltimore warehouse. Gun manufacturer Colt was among the shop's clients. Nearby was a Colt handgun. Its pistol grip and trigger inspired the new drill, cementing the ergonomic pistol-grip design as an essential feature of electric drills for decades to come.

Fig. 17. Duncan Black and Alonzo Decker in their factory in Baltimore, USA.

Footnote: This British patent below came out one year after the Fein drill. The Holmes/Siemens handheld electric drill and the Fein handheld electric drill are very similar in appearance.

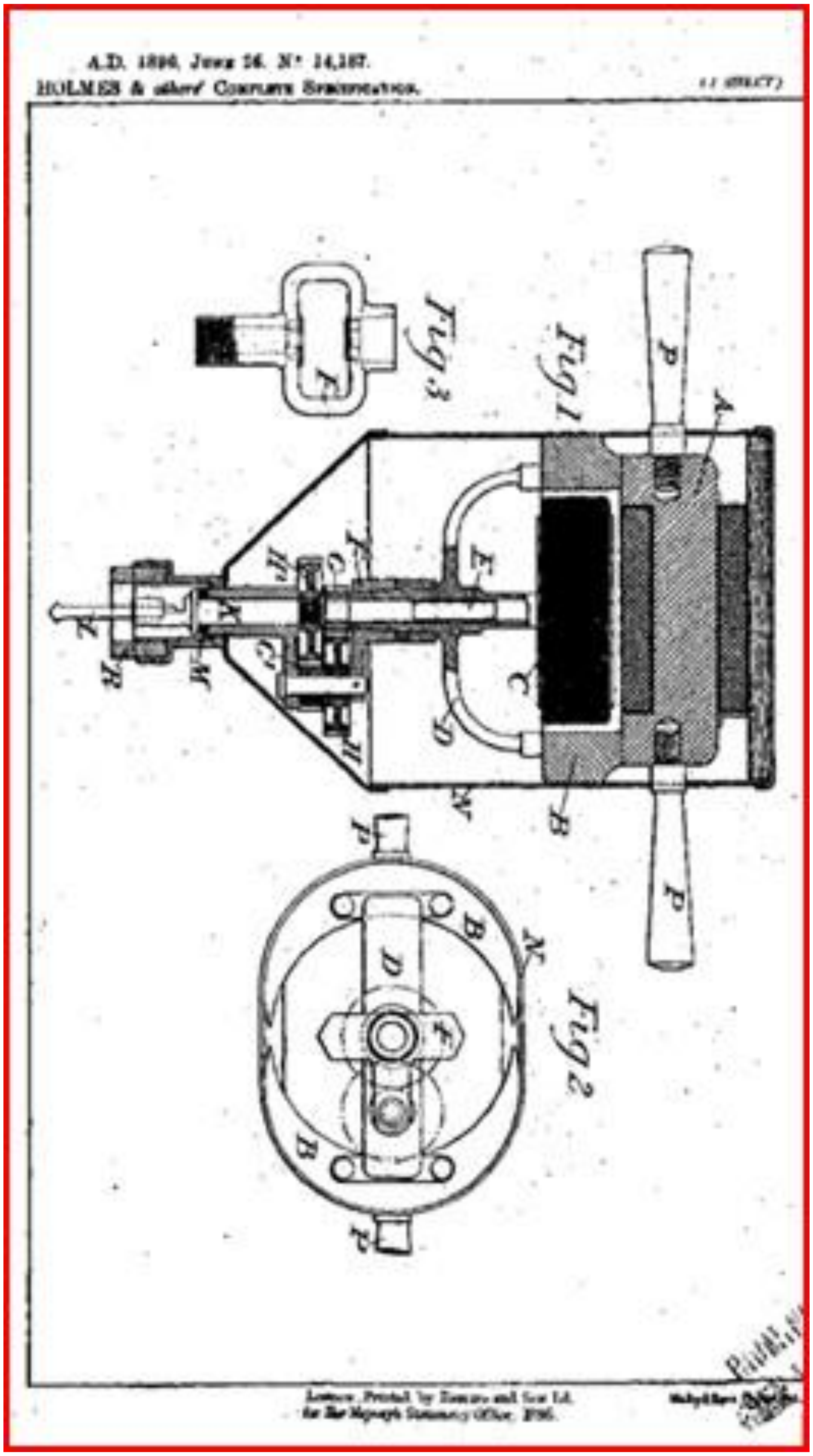


Fig. 18.

1896 June 26, No. 14,187 (A portable electric drill) this is not known to have been produced.

A Portable Electric Drill.

We, ERNEST HOLMES, of 3, Champion Terrace, Charlton, S.E. Civil Engineer, and SIEMENS BROTHERS & Co., LIMITED, of 12 Queen Anne's Gate, Westminster, in the County of London, Electrical Engineers, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :- This invention relates to a drill which a workman can carry from place to place and apply with the pressure of his hands to drill a hole, the rotation of the drill spindle being 'effected by an electric motor mounted within the casing of the drill and connected by flexible conductors to a source of electricity which may be stationary and at more or less distance from the place where the drill is applied.

Ref: DATAMP ronixtools.com tradeservicepro.com Black & Decker. 1910s Electric Breast Drill [Restoration]; https://www.youtube.com/watch?v=NpVnw7BDD6U. Vintagemachinery.org