History of a Forgotten Engine

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In 2017, there's more variety to be found under the hood of a car than ever. Electric, hybrid and internal combustion engines all sit next to a range of transmission types, creating an ever-increasingly complex evolutionary web of technology choices for what we put into our automobiles.

But every evolutionary tree has a few dead end branches that ended up never going anywhere. One such branch has an interesting and somewhat storied history, but it's a history that's been largely forgotten outside of columns describing quirky engineering marvels like this one. The sleeve-valve engine was an invention that came at the turn of the 20th century and saw scattered use between its inception and World War II. But afterwards, it fell into obscurity, outpaced by the poppet valves we use in engines today that, ironically, it was initially developed to replace.

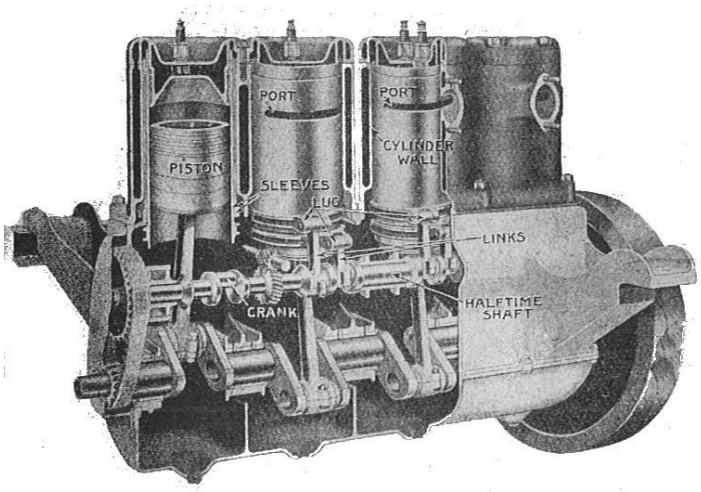
Back when the sleeve-valve engine was first developed, the poppet valves in internal combustion engines were extremely noisy contraptions, a concern that likely sounds familiar to anyone in the automotive industry today. Charles Yale Knight, the entrepreneur behind the design, took a note from steam engines to develop a contraption that replaced the poppet valves with metal sleeves that would slide around an engine's pistons. And Knight's initial design called for not one, but two sleeves around each piston. The idea was that the sleeves had holes in them that, as the sleeves slid around the piston, would line up periodically with the intake and exhaust ports on the piston, managing the entry and release of fuel, air and exhaust during the entire process.

The engine worked. It was indeed vastly quieter than other engines of the day, but it was also more efficient than other engines: It was better at getting air in and out of the engine and eliminated valve float and bounce. The tradeoff, of course, was that it was expensive and complicated to manufacture and required more oil than other models to ensure the sleeves continued to move smoothly over the pistons. In fact, the "Silent Knight" sleeve-valve engine is almost as well-remembered for its hunger for oil as for its quiet footprint.

Despite being an American invention, the sleeve-valve engine found its first success in Europe, and by 1913, was being utilized by six car manufacturers across four countries, including Daimler, the first manufacturer to give the design a chance, and Mercedes.

Soon enough, even American companies that had at first turned their nose up at the invention were incorporating it in their car designs. The engine reached its peak soon after when John North Willys built an automobile manufacturer almost entirely around the Silent Knight engine design, the most popular of which became the Willys-Knight, a mid-priced vehicle that sold well through the '20s.

The sleeve-valve engine, however, was one of many casualties of the Great Depression. Willys' company limped through the economic downturn, and by the time the economy was looking up again, poppet valve engines had caught up to the sleeve-valve and were quickly becoming just as quiet and efficient.



(By Andy Dingley (scanner) - Scan from The Autocar (Ninth edition, circa 1919) Autocar Handbook, London: Iliffe & Sons., pp. p. 38,fig. 21, Public Domain, *https://commons.wikimedia.org/w/index.php?curid=8771152)*

The sleeve-valve never saw another iteration in automobiles, no attempt to innovate and regain an advantage over other technologies, but it did still have one last moment to shine during World War II. Instead of in an automobile, however, the sleeve-valve was instead implemented in the Hawker Typhoon, a British fighter-bomber that became a mainstay in the RAF during the later years of the war. The Typhoon became Britain's answer to Germany's Focke-Wulf Fw 190, a fighter that had previously been able to outrun almost anything else in the air. And once the Luftwaffe, and by extension, the Fw 190, had been largely taken out of the war, the fighter-bomber found another use as a ground attack aircraft, bombing both infrastructure targets such as bridges and supply trains and enemy tanks alike.

Both of the Typhoon's primary functions were in part made possible by the sleeve-valve engine design it carried, which provided the extra horsepower needed for the fighter to keep up with the Fw 190 and carry heavier munitions like bombs.

Again, however, the sleeve-valve was eventually replaced by the jet engine, and it's rested in obsolescence ever since. Or at least, until very recently. Pinnacle Engines, a fresh contender on the market, has taken a second look at the sleeve-valve engine. Designed to produce reduced CO2 emissions at a higher fuel efficiency at comparable cost to other automotive engines, Pinnacle Engines is marketing their product to markets such as China and India that they view as hungry for those exact advantages. It's too early to tell whether the engine will catch on or not, but the company did receive a fair amount of attention in 2014–15, even drawing the attention of media outlets such as *Forbes*. It may be that the sleeve-valve is about to get a third day in the sun. **PTE**