

## Jan Brons



The Brons company dates back till around 1882 when the carpenter and master builder Tjako Brons opened a small repair shop in Wagenborgen near Delfzijl, the Netherlands. His oldest son Jan, who had a natural talent with things mechanical, helped his father in the repair shop at the end of the school day. At the age of 20 years Jan and his father Tjako began with the production of paraffine engines under the name Brons & Son.

The company moved in 1892 to Delfzijl, where they started a new repair and building shop for the production of paraffine engines. These paraffine engines operated on the Otto or four-stroke principle. They were typical of the period, using tube ignition of the type where, once the engine was running and up to temperature, it was possible to dispense with the blowlamp. The engine was named "Safety-Engine". The horizontal stationary oil engine was tried in other applications like vertical marine engines. Production of the paraffine Safety-Engine continued until 1904. Nanno Timmer became Jan Brons financial partner in 1900, when Timmer supplied necessary operating capital, Brons senior left the company, leaving his son Jan and Nanno Timmer to take over control. The new company of Brons & Timmer continued the Safety-Engine production, and they made repairs and shop machining, which still provided most of the income.

The Diesel engine and its emergence on the European market attracted Jan Brons' attention as the system of the future. In those early days the diesel engine suffered fuel and air pump problems, so Jan Brons set about developing and building an engine that, while operating on the diesel principle, eliminated the troublesome fuel and air pumps. This was no simple task but, after two years of experiments, an engine using the Brons prechamber design had been produced. Not long after filling the first patent in 1904 Brons had the great fortune to become friends with Dirk Bonthuis-Tonkes, a young Dutchman with a German engineering degree. Tonkes became a partner and advisor to Jan Brons after Nanno Timmer left the Brons & Timmer engine factory in 1905. Timmer began in 1905 his own engine factory nearby the town of Meppel till 1927. In 1906 the two men (Brons and Tonkes) organized a new company in which each was a co-managing director.

In 1907 Brons and Tonkes moved from their old factory in Delfzijl to a new site in Appingedam, a city between the port of Delfzijl and Groningen. The name of the new company was: N.V. Appingedammer Bronsmotorenfabriek. The Brons motorenfabriek was existed in Appingedam for 82 years till Waukesha Engine Division from Milwaukee of the United States of America took over the Brons factory in 1989.

## Jan Brons engines

### The Brons Internal Combustion Engine

The Brons Internal Combustion Engine is a four-stroke high pressure engine provided with a very simple spraying device. The working principle is as follows: First stroke: intake of atmospheric air. Second stroke: compression of the air. Third stroke: combustion of the oil and expansion of the gases. Fourth stroke: exhaust of the gases. This cycle is in principle the same as the Diesel cycle, and therefore the Brons engine has the same high efficiency as the Diesel engine. The simple and safe spraying device gives the Brons engine, working without an air compressor for high pressure and without a high pressure combustible pump some very important advantages. By these it is possible to build even small oil engines with low fuel consumption which are comparatively cheap and very easy to attend.

The new Brons oil engine has in the sprayer one valve and one needle, the latter moved by the governor, to control the quantity of combustible. The lower end of the sprayer is provided with a cup with holes, which partly protrudes into the cylinder. During the first stroke the sprayer-valve is open and the necessary quantity of fuel flows into the cup by gravity and suction. During the second stroke the valve is closed, the compression raises the temperature of the air and this causes self ignition of the partly vaporized fuel in the cup. By the force of this explosion the main part of the remaining liquid combustible is injected and sprayed through the little holes into the cylinder, where immediately the main combustion takes place. The moment of ignition is fixed by some factors, which are thoroughly regulated by the Brons factory, and no change or derangement is possible. The engine runs perfectly on all kinds of crude oil, gas-oils and lamp-oils, except those with high asphalt base. A little combustible pump of simple construction (by engines of 12 HP and more) moved by the camshaft, brings a constant quantity of combustible upto the sprayer; the needle controls the necessary quantity; the rest returns by an overflow pipe to the oil tank. By this arrangement it is prevented, that the cylinder can fill itself with fuel and cause damage when started again.

The centrifugal governor is enclosed. Where the shaft of the governor passes the top of the frame a spring with a screw is mounted in order to control the revolutions of the engine. By the camshaft of all engines except the 2 till 25 HP engines, a gear pump is moved, which pumps the lubricating oil to the bearings, the oilpan and the gears. A ball-check-valve fitted at the lower end of the connectingrod, dips at each revolution into the oil surface in the oilpan, and in this way oil is pumped to the crankpin and pistonpin and at the same time as much oil splashes round as is necessary for lubricating the other moving parts. Having been thoroughly adjusted in the factory, the lubrication is permanently in order and rearrangement is unnecessary. Should rearrangement be necessary this can be easily done through adjustment of the ball-check valve.

A water pump, also driven by the camshaft, secures a perfect circulation of water in water-jacket and cylinder head. The construction enables the operator to remove, clean and replace the valve during the running, in case very muddy water is used. All engines with the exception of the 2 till 12 HP. sizes, are started by compressed air operating in the two cycle principle so that they accelerate very quickly and after changing to "Bedrijf" (WORK) run immediately on crude oil. The 2 till 12 HP engines are started by hand and are therefore provided with a safety starting handle. The compressed air-starting mechanism is provided with a simple safety device, which excludes the possibility, that the engine is changed over to "Bedrijf" and the valve for compressed air remains open. Therefore the air handle moves in the meantime a bolt which fixes the cams in starting position when placing the starting handle to "Bedrijf". When the air valve is closed and the cams slide by the force of a spring into their normal position, it is therefore impossible to open the air valve on account of the aforesaid bolt. The starting air is supplied by a small independent air compressor (only the engines of about 1916) belt-driven from the engine. About 16 atmosphere is used for starting. Every time after starting of the oil engine the air pump refills within a few minutes and is stopping afterwards. By these mechanisms all causes for getting too high a pressure in the cylinder are prevented and the Brons engine is very simple in attending, in contrast with Diesel engines, hot-bulb engines etc.

To be certain that in the cylinders of multiple-cylinder-engines an equal quantity of power is developed, a patented thermal regulating mechanism is fitted, which automatically controls the load of each cylinder of the engine. In the exhaust port of each cylinderhead a needle is sunken and by the temperature of the exhaust gases it expands and by means of a balance and a bell-crank it moves the needle valve. If in two cylinders different quantities of energy are developed, the temperatures of the exhaust gases are also different and the linear expansion of the needles also. By the levers the needle valves are now moved, with the effect that all cylinders again deliver an equal amount of energy. One

of the levers is lengthened and actuated by the governor. So it is possible to get a constant number of revolutions.

The engine is manufactured of high grade materials and the workmanship is of the highest quality. Cylinder, piston, valves and valveseats are of special materials, machined with great accuracy and ground; and parts such as pistonpins, rollers of valvelevers, valvespindles and cams are carefully casehardened and ground. Before leaving the shops each engine is thoroughly examined in all parts and tested for a long time according to a checklist from half load to overload.

The original Brons oil-engine of the Appingedammer Bronsmotorenfabriek is very simple in attendance; requires no technically schooled men; is absolutely reliable; is the only crude oil engine in which cylinder, piston and valves do not get dirty nor leak; the Brons factory has in that matter the longest and most reliable experience to record; has a very low fuel consumption (large engines 185 grams oil/ HP/hour. Small engines 225 grams oil/HP/hour); has a very low consumption of lubricating oil (3 to 6 grams per HP/hour); has an overload capacity of 20% for short periods; is manufactured in capacities from 2-220/240 HP.

#### List of numbers of the production of Brons engines

single cylinders;	records.	two cylinders;	records.
2 HP	= 15	10 HP	= 2
4 HP	= 77	12 HP	= 3
5 HP	= 166	15 HP	= 2
6 HP	= 104	18 HP	= 1
8 HP	= 184	20 HP	= 1
9 HP	= 276	24 HP	= 3
10 HP	= 64	30 HP	= 115
11 HP	= 53	40 HP	= 3
12 HP	= 101	44 HP	= 3
14 HP	= 8	50 HP	= 111
15 HP	= 242	55 HP	= 1
16 HP	= 84	60 HP	= 82
20 HP	= 83	70 HP	= 48
25 HP	= 178	75 HP	= 7
35 HP	= 14	80 HP	= 28
37 HP	= 19	90 HP	= 10
40 HP	= 32	100 HP	= 6
45 HP	= 22	110 HP	= 3
50 HP	= 10	120 HP	= 4
55 HP	= 3	130 HP	= 20
60 HP	= 23		
65 HP	= 6		
80 HP	= 1		
three cylinders;	records.	four cylinders;	records.
24 HP	= 2	50 HP	= 1
45 HP	= 26	64 HP	= 4
47 HP	= 2	120 HP	= 40
50 HP	= 2	150 HP	= 10
90 HP	= 16	160 HP	= 13
105 HP	= 40	180 HP	= 6
135 HP	= 3	220 HP	= 2

Only one 6- cylinder pre chamber engine was built in 1918 and has been the driving engine in the factory for more than 42 years. During this period the engine ran for more than 16 hours a working-day. It is not known how much power was developed by this engine, because in 1918 the appropriate testing apparatus for this kind of engine was not available at the Brons factory. Mr. Jan Brons thought that the engine developed between the 480 and 600 HP.