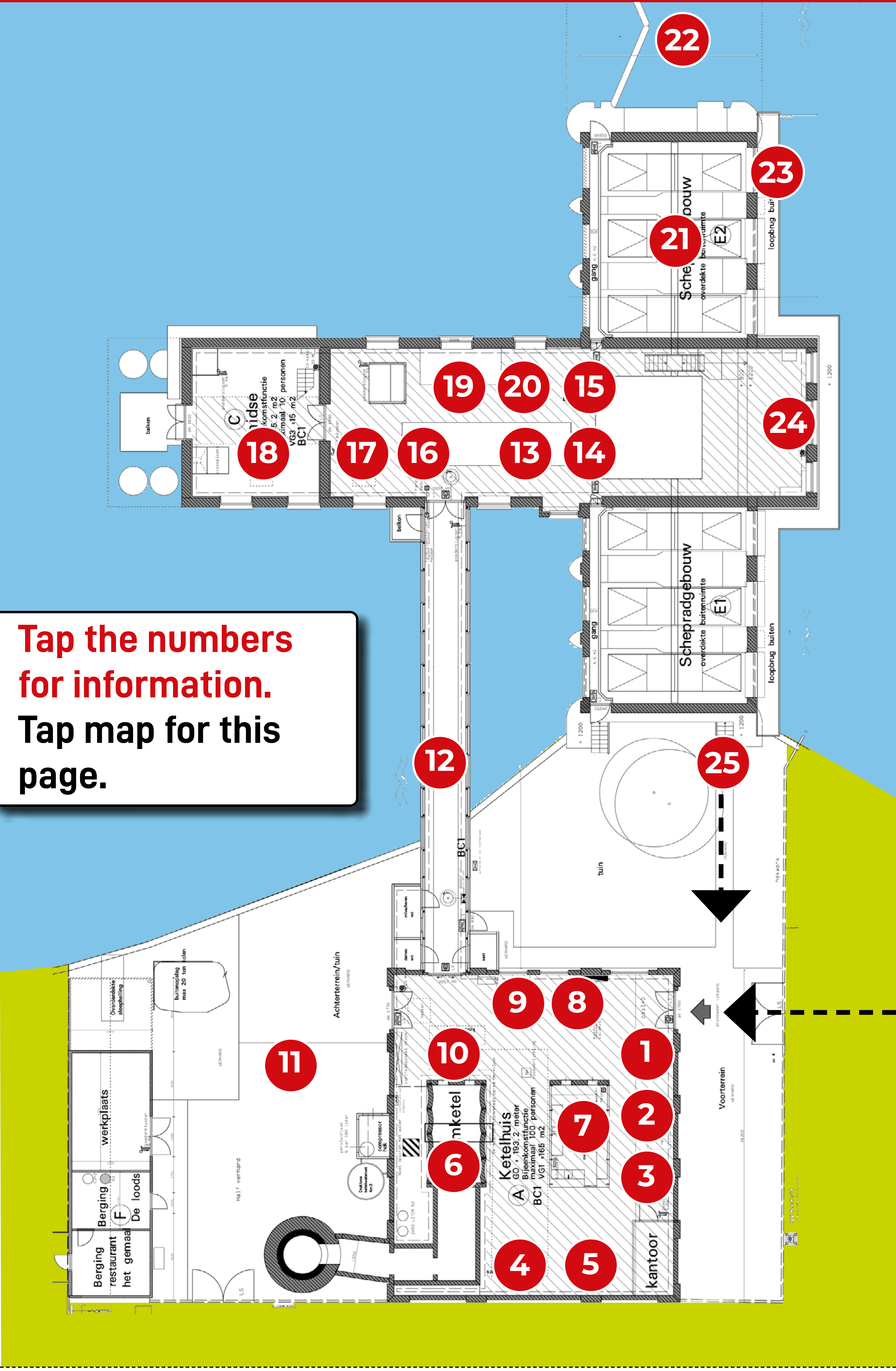
Guided tour & audiotour

Steam pumping station Halfweg

With interactieve map

Map of the pumpingstation



Map

1 Map of the Netherlands without dunes or dykes

Welcome to the Halfweg steam pumping station, the oldest and largest working scoop wheel steam pumping station in the world. It is a storage basin pumping station, built during the struggle against water, a struggle that, while part of our past, is still an essential and necessary part of the present and future. Take a look at this map. If we didn't have dykes and dunes, two-thirds of the Netherlands would be permanently under water at high tide. You are now under the cross. **Push the audiosymbol for the audio.**

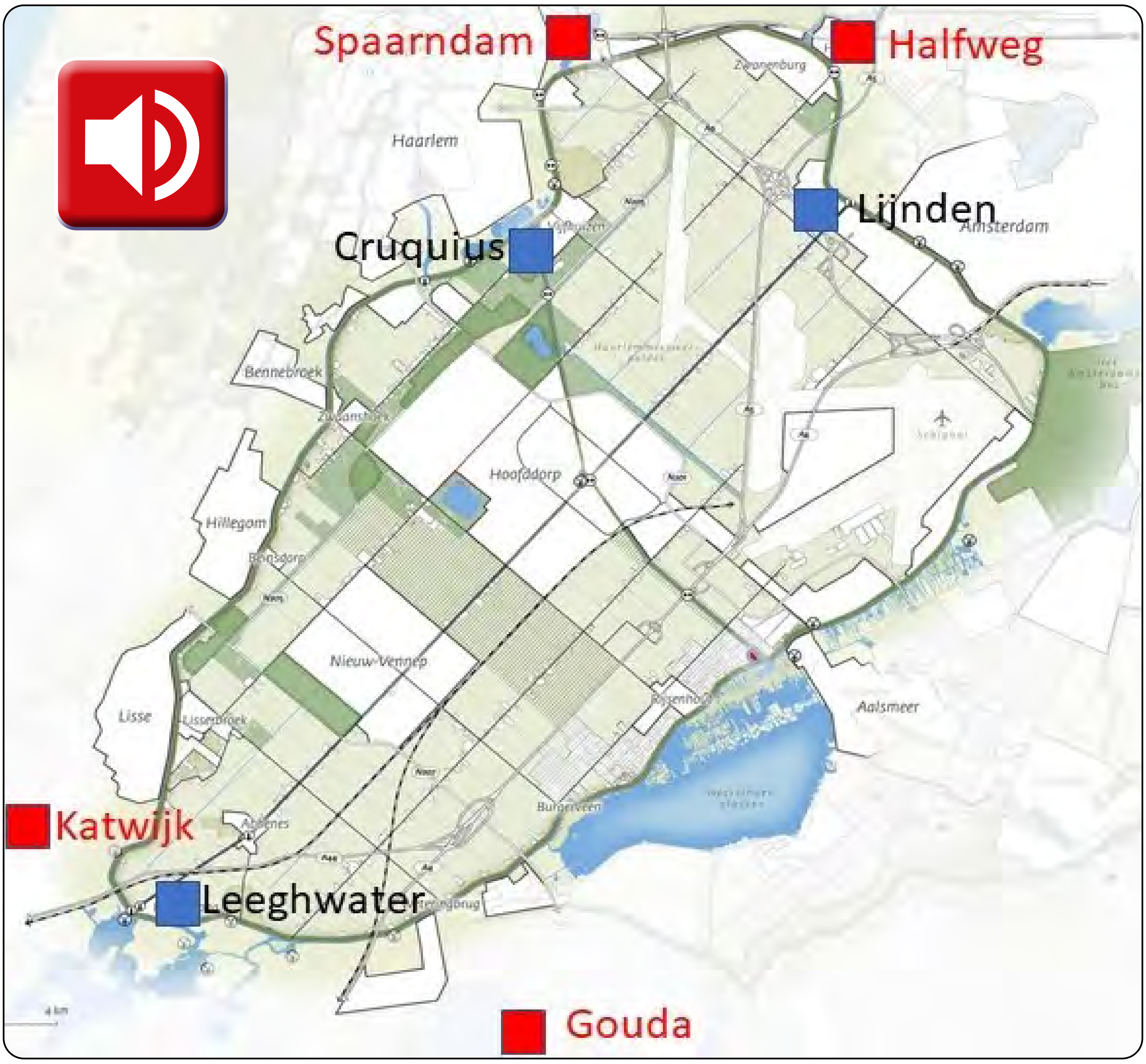
The Dutch have always been good at fighting the water. Fortunately, therefore, it never got to the point where the Netherlands largely disappeared under water. If you zoom in on the area where you are now, you will see on the map on the right (route point 2) that this used to be all water.

2 Map of three lakes

You can see a huge lake on the map. How did this come into being? This area originally consisted of peat. If you excavate peat and dry it, it becomes turf, which is an excellent fuel. From the year 1200, due to population growth, the people living here began extensive peat extraction, which resulted in large peat bog pools. This led to the creation of three lakes: the Leidsemeer, Spieringmeer and Haarlem-mermeer. Storms eventually transformed these three lakes into one large inland sea, the bottom of which was, on average, four and a half metres below sea level. Due to the prevailing south-westerly wind, this inland sea became a threat to the cities of Haarlem and Amsterdam. From the year 1500, plans were already being made to reclaim this

inland sea. Due to a lack of technical resources at that time and political disagreements, it wasn't until 1837 that King William I ordered the enormous inland sea to be drained.

3 Map of Haarlemmermeer with storage basin and polder pumping stations



How did this reclamation work? First, a dyke was built around the inland sea, with a ring canal being dug behind this dyke. Everything was done by hand, with shovels and wheel-barrows, and took a total of eight years to complete. The result was a ring canal, 59 km in length. Three polder pumping stations (blue block) subsequently pumped the water from the polder into the ring canal, leading to the drying up of the lake in 1852. With four other

Map

pumping stations (red block), the water was ultimately discharged into the sea either directly or by river. These pumping stations are called storage basin pumping stations. Halfweg steam pumping station, where you are now, is a storage basin pumping station, and has been used for this purpose since 1852. You can find the water pumping stations by pressing the button on the map on the wall. Now walk straight ahead to route point 4.

4 Watercolour of Halfweg steam pumping station

Halfweg steam pumping station was built in 1852, and consisted of three single-fire steam boilers and a 100 HP steam engine. However, soon this capacity proved too small. Therefore, in 1888, capacity was considerably increased by the addition of two steam engines, each with 150 hp. Again, unfortunately, the capacity proved to be insufficient. Therefore, the Dutch company Stork was commissioned to build an efficient steam boiler and steam engine, and this plant was completed in 1923. It is still in use today, and consists of two British-type Wilcox-Babcox water tube boilers and a 500 hp DC steam engine. The amount of water the pumping station could displace per minute was thus increased to 1500 m3, or 1.5 million litres of water per minute. Finally, in 1977, the steam pumping station was replaced by an electric pumping station in the Western Harbour area of Amsterdam, and became a national monument in 1986. Now sit back and look at the TV screen.

5 TV screen

The TV screen shows a continuous film to accompany your visit to the pumping station. Why not relax for a bit and watch the film before going further? The text, however, is only in Dutch.

6 Company steam engines

You are now looking at a number of steam engines. These were used in the past for all kinds of work, for a pile driver, or to drive a generator, for example. The engines here have been saved from the scrap heap and restored. What is a steam engine and what is steam? A steam engine is a machine that uses steam for its propulsion. Steam is an invisible and odourless gas, and is created by heating water. Water boils at 100 degrees, and then gradually turns into steam. You cannot see this steam. The curling steam that used to come out of the whistling kettle in the past, and now comes out of the spout of the electric version, is not, in fact, steam, but water vapour. Water vapour is created by steam being cooled by air, which causes it to become visible. Therefore, you see water vapour, not steam.. If you don't let steam escape, pressure will build up, just like with an inflated balloon. With this pressurised steam, you can set something in motion. If you release a balloon, for instance, it will fly away.

7 Steam boiler 1

You are now standing in a dismantled steam boiler. This boiler has not been restored, so you can see what a boiler looks like from the inside. Where you are standing now, there used to be a grate where a coal fire was lit. Through the shutters behind you, coals were thrown on the grill, which heated the water. The water ran down from the big drum above you through thick pipes, with the whole system containing about 7,000 litres of water. The heat of the approximately 1300-degree fire brought this water to the boil, causing it to circulate and gradually turn into steam. This steam travelled into the upper small drum. After circulating once more through the thin

pipes, the steam left the boiler at a temperature of 330 degrees through a steam pipe on its way to the steam engine. More on that later. You can now move on from the dismantled boiler to the model table.

8 Model table

In front of the window, is a table with a large number of steam engines, almost all of them self-built. They give you a good idea of what steam was used for. Steam engines are still in use today. In production processes, cooling water is often used that, after circulation, still has a temperature of over 80 degrees. This hot water is then heated to steam in a gas boiler, which drives a small generator that can, for example, provide lighting for an industrial site. Now walk on to the boiler room.

9 Boiler room

Here, the stokers and coal shovellers can take a break from their work. The construction and the bench are still original from 1923.
If you sit down on the bench for a moment, you can contemplate how physically demanding the work must have been for the stokers. They had to work in a dusty environment and were affected by coal dust, as well as the changeable and sometimes extreme temperatures. Now walk on to the boiler room near boiler 2. This is exactly the same boiler as the dismantled one you've just seen, only this one still works.

Map

10 Steam Boiler 2

Stoking the boiler requires a lot of skill. The stoker must make sure there is a good firebed, one that is nice and even, has no gaps, and that gives the highest yield. And because there is a delay between tossing on the coals and the rise of temperature and pressure, he has to be constantly anticipating, because if he is too late adding more coal, the steam pressure will drop. Indeed, the stoker must ensure that the steam pressure doesn't drop below 8 bar and does not exceed 12 bar. See the copper meter on the top right. If he throws too much coal on the fire, the fire will become hotter than necessary and the coal will be wasted. About 15 barrows of coal are burned per firing session.

Next to the boiler is a cupboard with various meters and a recording instrument that shows the composition of the flue gases: the mono device. Using the diagram that is drawn, the stoker can see how well he is firing. The cupboard with meters and switches is still completely original and working, and is quite unique.
At the top left of the boiler is a gauge glass for checking the water level in the boiler. This water level is of the utmost importance, because if this is too high, the boiler won't function properly, while it can be extremely dangerous for the water level to go too low. When the water level is too low, an alarm whistle ("Black Whistle") is activated. Because the steam pumping station is located in a residential area, the coal has to meet high standards, and must therefore be low in soot, dust and sulphur. This makes the coal expensive. Now walk out through the side door. Here you can see the coal tip and the chimney.

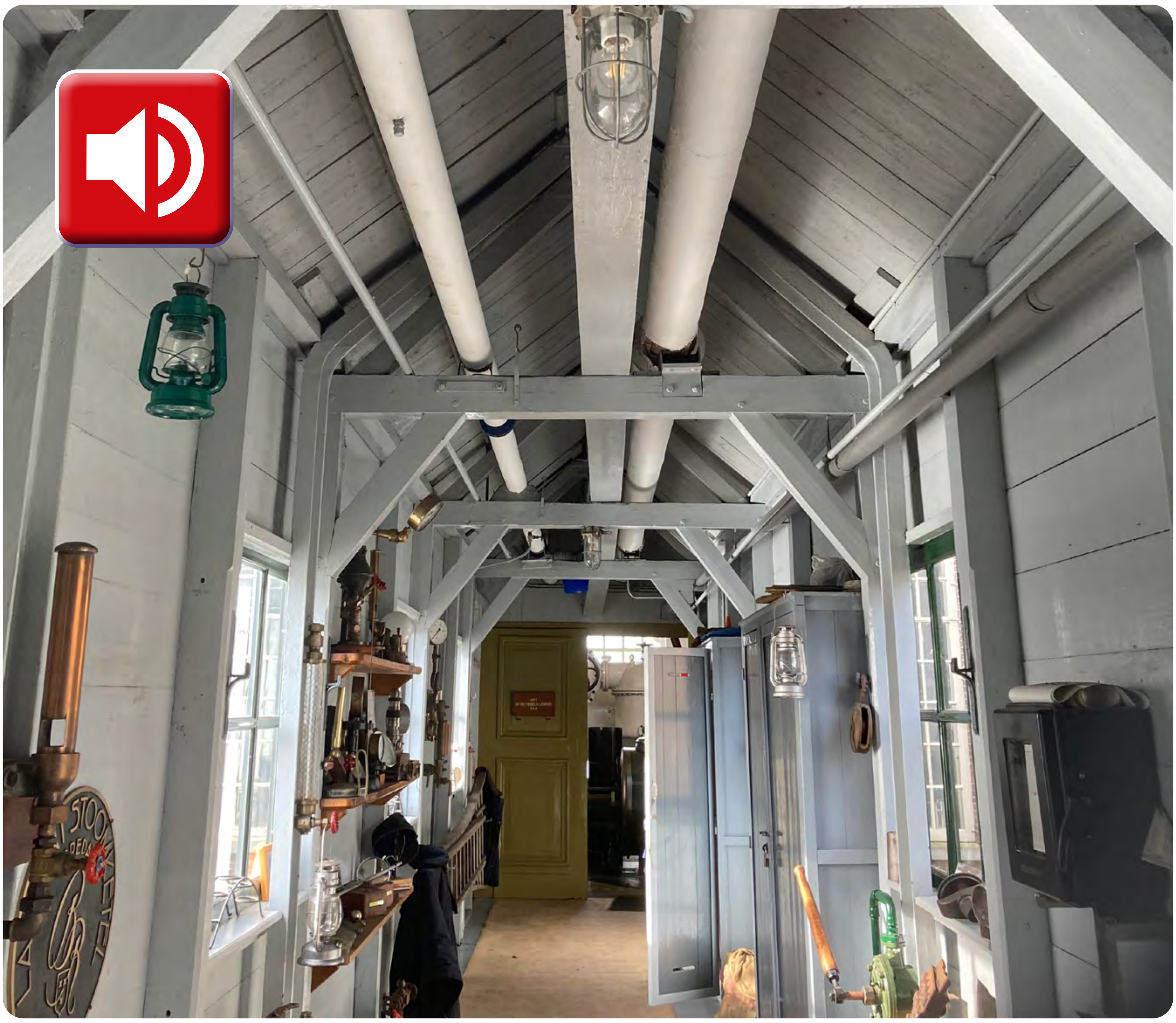
11 Chimney and coal tip

The coal comes from South America and is therefore expensive. If the firebed burns well, you won't see any smoke coming out of the chimney. This means no soot formation. Only after throwing on some new coal do you see some smoke coming out of the chimney for a few minutes, because complete combustion hasn't yet been achieved. After a firing session, of the 15 barrows of coal that

have been burned, only a few buckets of ash remain. The current chimney dates from 1911, and, in 1957, this was raised from 34 to 39 metres. The outside diameter at the bottom of the chimney is 3.8 metres. The chimney rests on a 5.15 by 5.15 metre concrete foundation slab and on 36 piles. Now go back inside and continue through the sliding door to the connecting corridor.

12 Connecting corridor

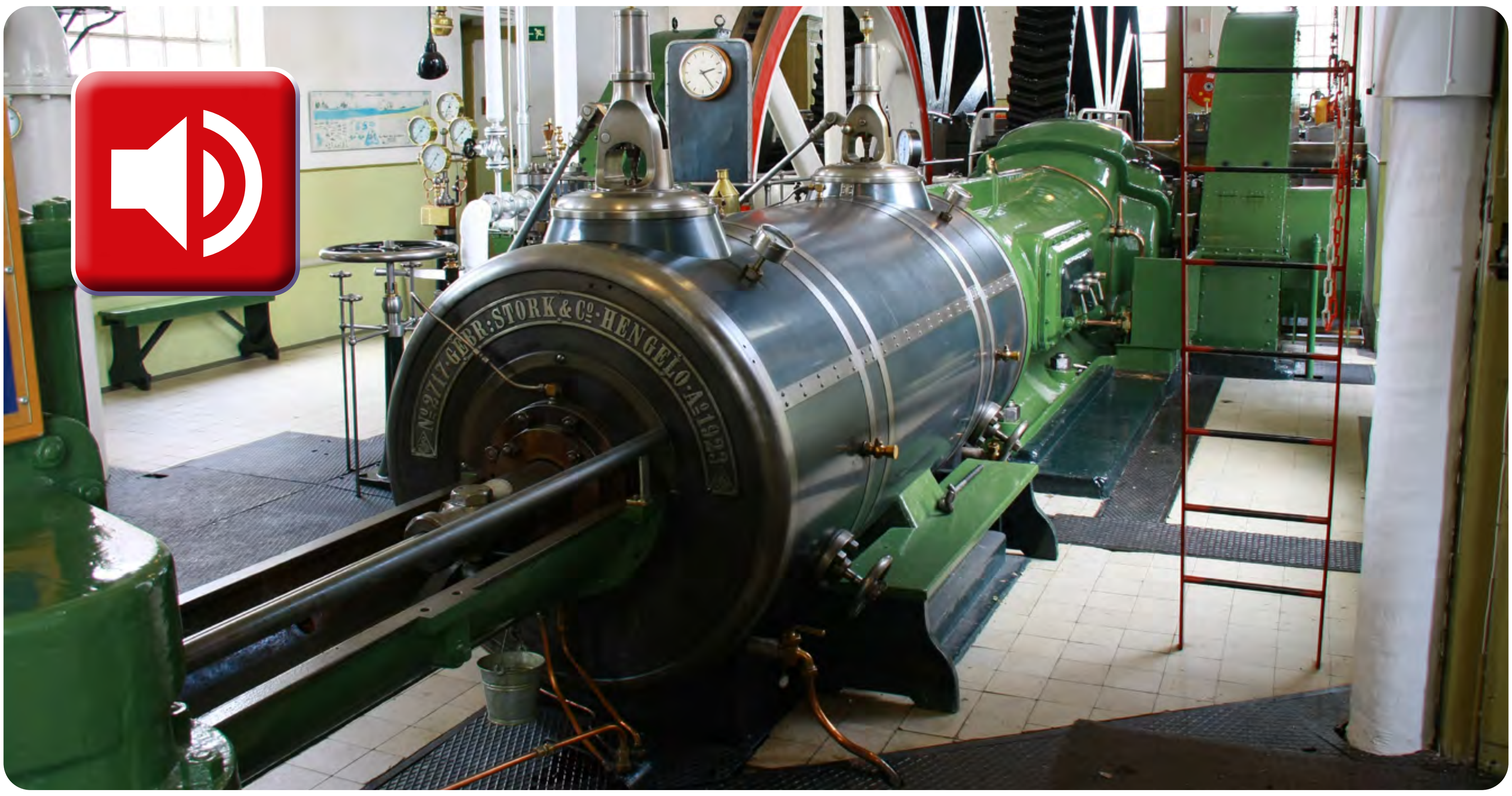
In 1852, the boiler house and engine room formed one unit. The boiler house stood where the workshop and blacksmith are today. You will get to this later on in the tour. You have just left the boiler room, which was built separately in 1888. From this new boiler



house, a connection to the engine room had to be made for the steam pipe. Above on the right, along the ceiling, you can see the steam pipe running. This brings the steam from boiler 2 to the engine. The temperature in the pipe is 330 degrees, and the pipe itself is only wrist-thick, with most of it consisting of insulation material due to the heat of the steam. The return water pipe runs on the left side of the ceiling. We will return to that later. You are now leaving the connecting corridor and entering the engine room.

13 Steam engine

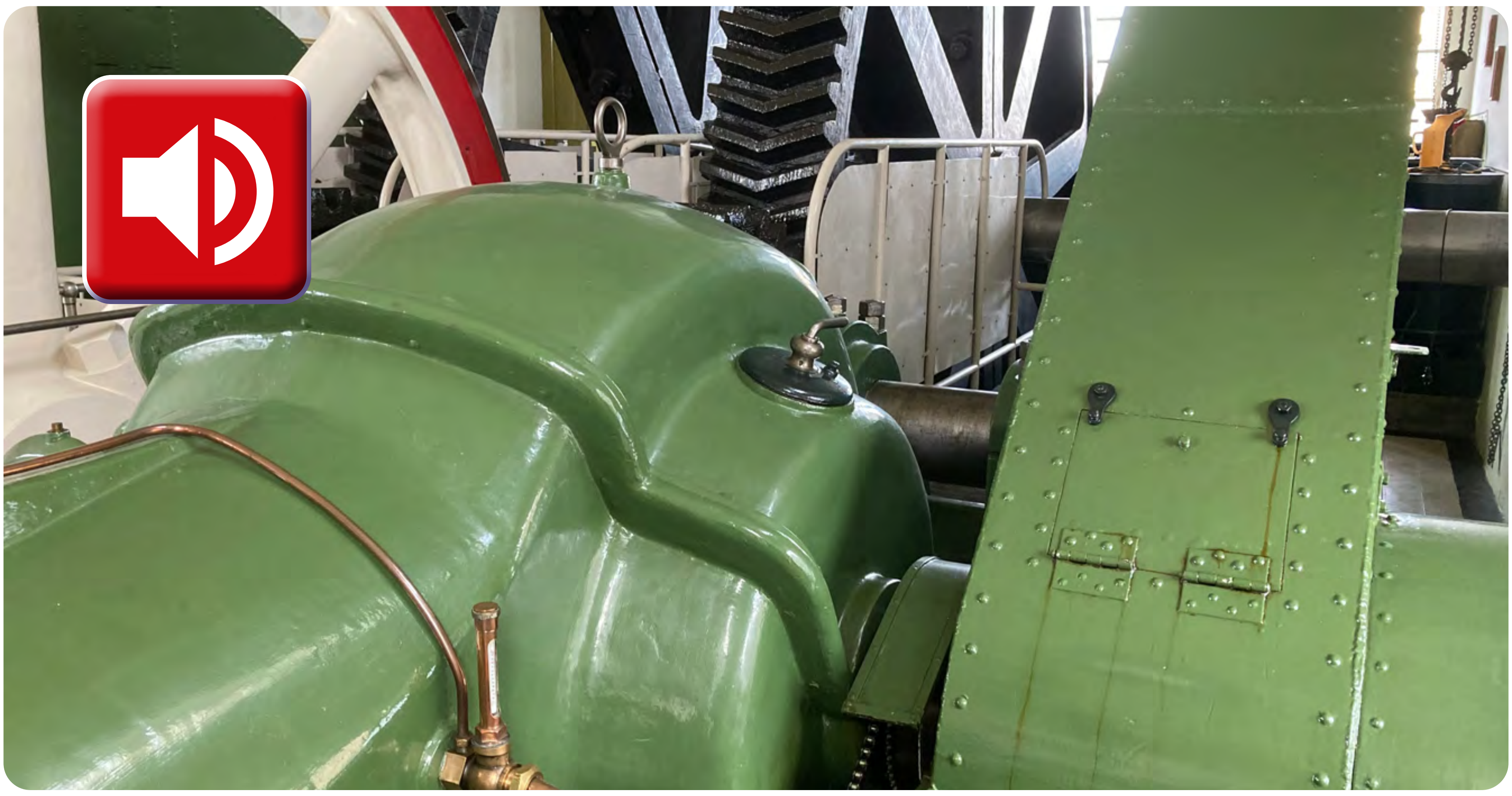
When you enter the engine room, you will be standing in front of the steam engine. Like the boilers, it was built in 1923 by the Dutch firm Stork. Through valves on the



machine, the steam alternately enters the left and right halves of the cylinder, moving the piston back and forth. The waste steam leaves the engine through ports in the bottom. The cylinder is only 57 cm in diameter, everything around it is insulation.
The internal temperature is about 200 degrees on average. A double piston rod is attached to the piston, which drives a crankshaft on the right and a double pump on the left.

14 Crankshaft

The piston rod on the right-hand side ends in a spherical drum, in which the crankshaft turns. The back and forth motion of the piston rod is converted into a rotating motion through the crankshaft, similar to cycling, where the up-and-down movement of



your leg is converted into a rotating wheel by the pedal (the crankshaft). A heavy flywheel is mounted on the long left section of the crankshaft. This is the fast-spinning red wheel in the middle. A steam engine needs a flywheel to help it pass dead centre. This flywheel has a diameter of 2.5 metres and makes 105 revolutions per minute. Now stand where you are and observe the flywheel and the gears.

15 Flywheel and gears

At both ends of the crankshaft, in the closed semi-circular green cabinets, gears are mounted to reduce the speed of rotation. This increases the force on the shaft of the scoop wheels. Now walk on to the pump on the left side of the steam engine.

16 Twin pump

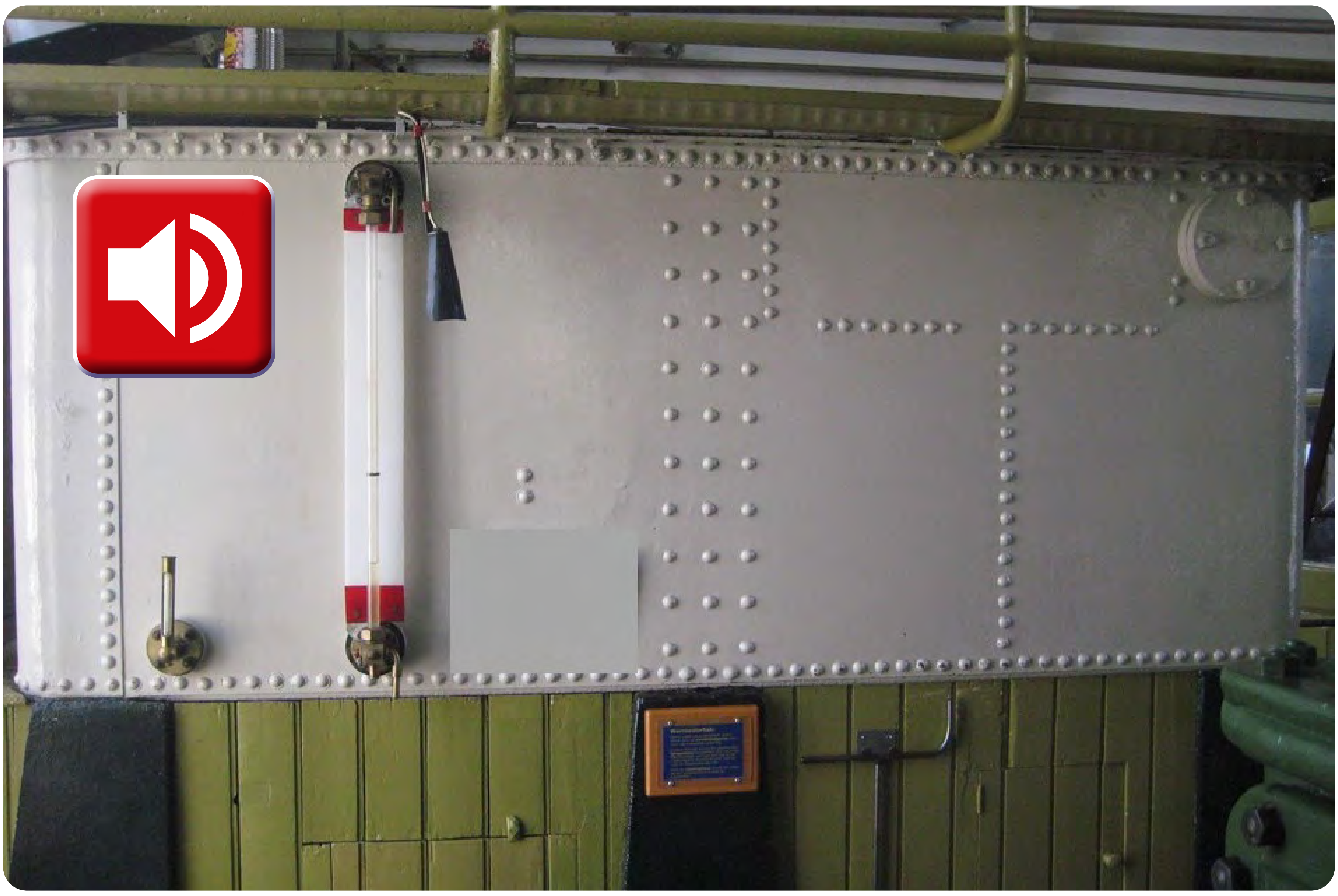
On the left side of the steam engine, you can see a square pump driven by the left piston rod. This has a dual function, and is a cooling water and vacuum pump. The waste steam leaves the engine in the middle at the bottom and enters the large white boiler on the other side through the cellar via a thick white tube. This is the condenser (for explanation, see route point 19 later on). The right part of the pump creates a vacuum in the condenser through the white tubes, so that the piston moves more freely. The left

Map

part of the pump draws cooling water from the Ringvaart canal to cool the steam in the condenser. This is done using the blue pipes. The steam that is condensed to water in the condenser is guided to a storage vessel: the hot water tank. That is the square container on the left. Now walk around the engine to the hot water tank.

17 Hot water tank

If the water level in the steam boiler gets too low, water from this container must be pumped through the return pipe at the top of the connecting corridor to the boiler. The stoker will inform the driver with a bell signal. During a firing session, the plant loses a few



hundred litres of water out of 7000 litres per day. You now see the entrance door to the workshop and forge on your left.

18 Workshop/smithy

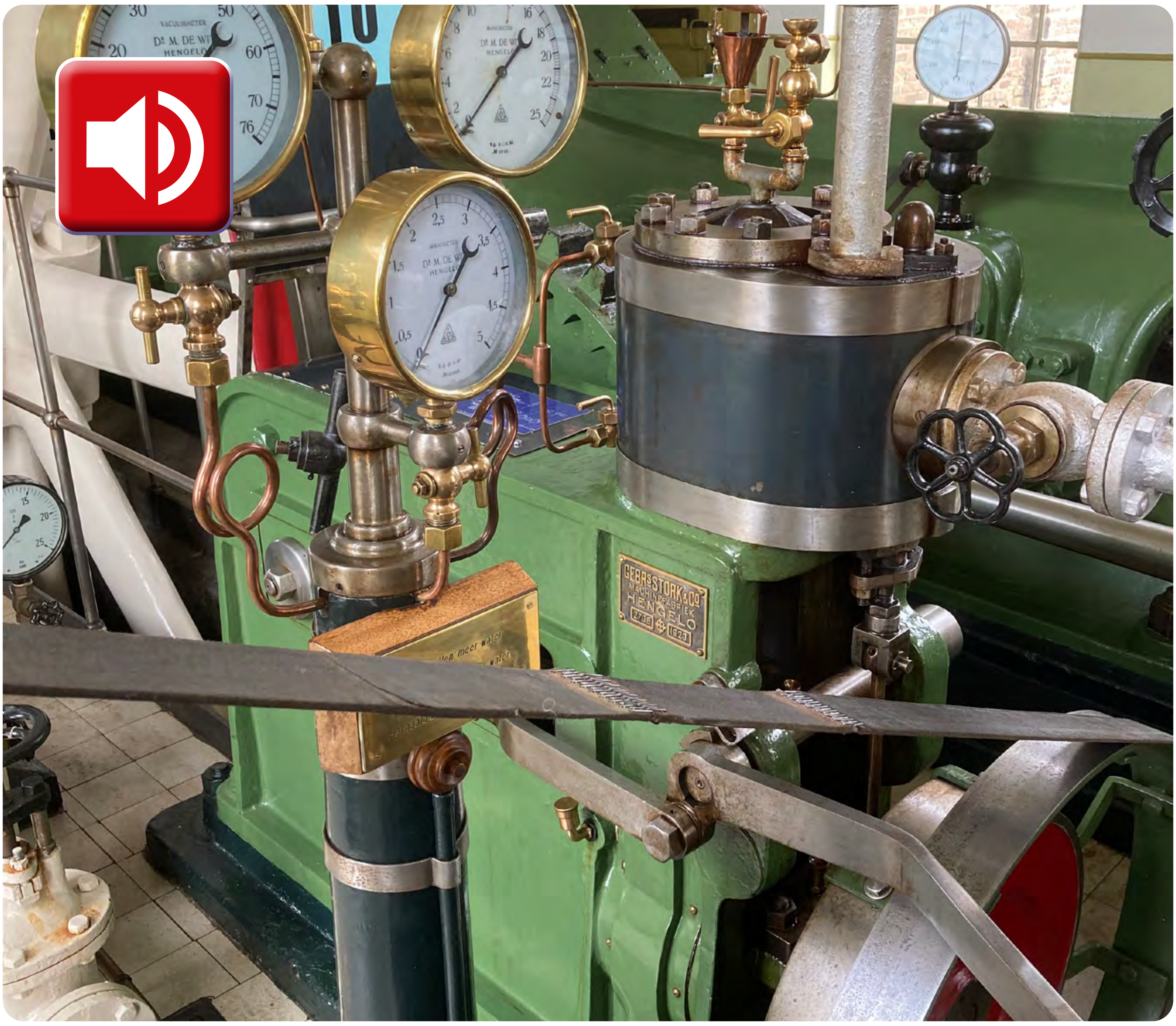
The steam pumping station also needed a workshop where repairs could be carried out. During firing sessions, the blacksmith will tell you all about water, fire and iron. He also shows how to forge the iron when it is hot. He also lets children wield the forge hammer and sometimes make something nice.
You are now once again leaving the forge and walking straight ahead to the condenser and centrifuge.

19 Condensor and centrifuge

We have already spoken about the condenser. Before the waste steam enters the condenser, the horizontal boiler, it is cleaned of oil residues in the centrifuge (see sight glass). The steam cooled to water in the condenser is then pumped into the hot water tank through various pipes. Now let's move on to the turning gear.

20 Turning gear

The turning gear stands behind the pillar with the gauges and is driven by a small vertical steam engine. This preheats the engine and brings the piston of the steam engine into the starting position, which is a fraction after the piston has started its return



movement. The operator then quickly uses the large horizontal wheel to open the main shut-off valve to release the steam into the cylinder.

When the pumping station isn't running, the turning gear is used to move the large engine and all the gears attached to it, along with the scoop wheels, so that maintenance work, for example, can be carried out. The turning gear is not driven by the small steam engine, but by an electric motor. Now walk on past the turning gear to the scoop wheels. Enter the scoop-wheel house on the left.

21 Scoop wheels

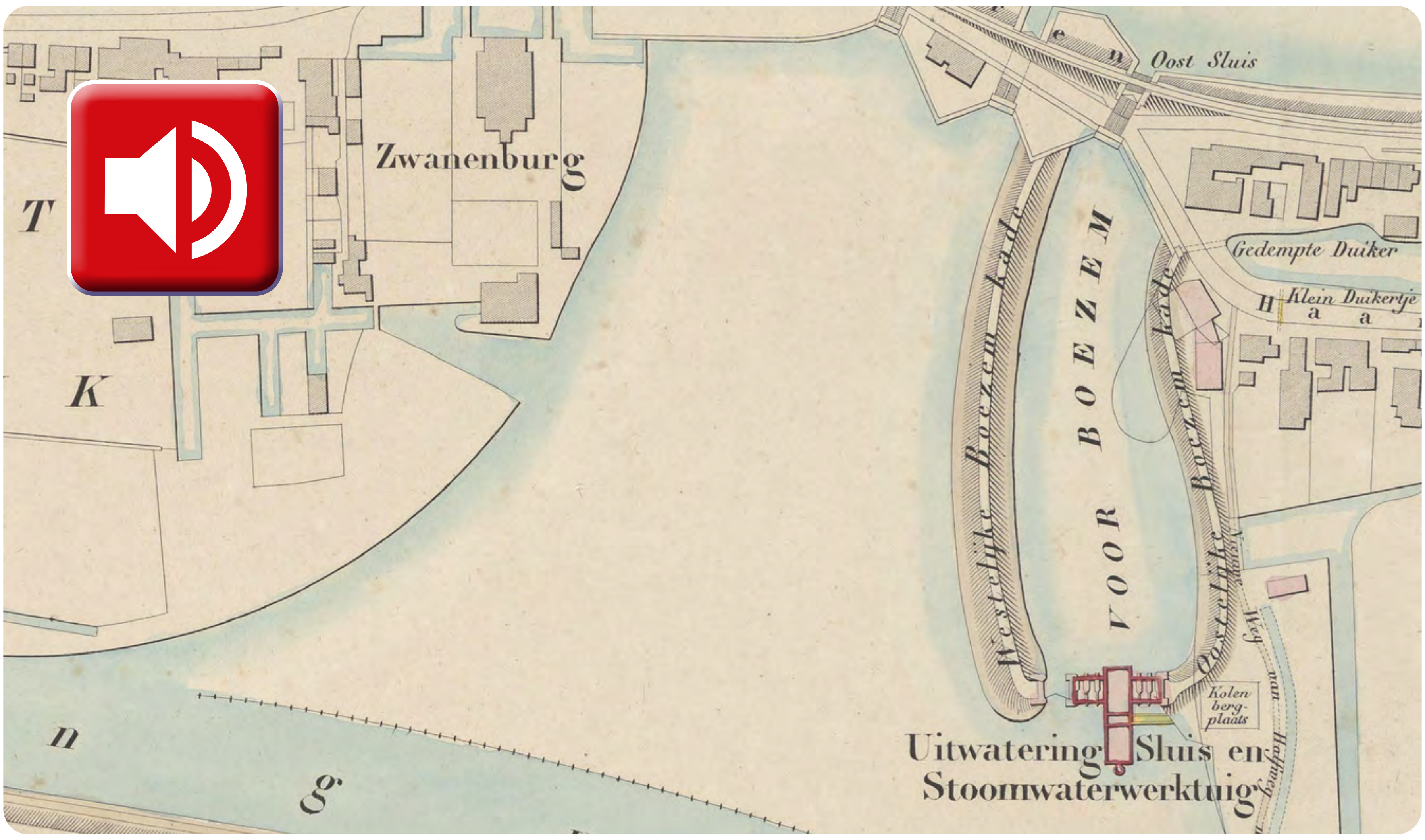
You can see the impressive scoop wheels here. There are two scoop-wheel houses.

Three scoop wheels turn in each scoop wheel house. Together, they displace 1.5 million litres of water per minute. The maximum lifting height is 60 cm. A scoop wheel has a diameter of 7.5 metres and a width of 2 metres. They rotate under water in a half-moon shaped concrete tank. The distance between the blades and the bottom of the container is only 2 cm, so very little of the scooped up water flows back. To prevent a floating object in the water from jamming a wheel and causing damage to the entire installation, the blades

are made of planks that break easily. The plank can then be quickly replaced. The blades are angled on the shaft. This is the most effective position from an operational point of view, and prevents water from flowing back when the system is at a standstill. The doors are also lowered on the outside.
Now walk through the narrow corridor past the scoop wheels to the lock.

22 Lock

In those days, the lock was used as a drainage sluice in order to drain the inner water and reverse the outer water. This is also known as a floodgate. The island you see is what remains of the dyke that was dug away.
Now walk on further via the outer circle.



23 Outer circle

When the pumping station is running, you can see here the force with which the water is ejected. This creates a strong current that reaches as far as the bridge in the distance. Now walk on to the front entrance of the engine room to see the two huge gears.

24 Gears

The huge (5 metre diameter) gears are the original ones from 1888 and they still work perfectly! They are connected to the scoop wheels by massive thick shafts.
The gears have herringbone gearing, which was rather innovative in 1888. Herringbone gearing makes less noise compared to

straight toothing, and there is less resistance and therefore less wear. The gearing still looks fine and has never been replaced. Herringbone gearing was invented by André Citroën while he was still working in a machine factory. When he opened a car factory, he put two herringbone teeth as a logo on his car, and this is still the Citroën logo today.

25 Exit

You have now reached the end of the guided tour. If you continue and go down the steps, you will reach the exit gate via the

garden. We thank you for coming and hope you have enjoyed your visit to the Halfweg Steam Pumping Station, which is run entirely by volunteers. If you would like to relax with a cup of coffee or soft drink, go back in through the main entrance and order something at the reception.

Colophon

This audio tour is owned by the Stoomgemaal Halfweg and has been realized with the cooperation of the audio tour working group.
Photos: Patrick Goossens, Frans de Haan, Kesten den Hartog, Mary Knijn, Han Maas, Hans Pont and Ruud Wever.

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