Fog Horn used at Low Head lighthouse, Tasmania

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1. Purpose

The purpose of this paper is to describe the use and preservation of the fog plant assembly used at Low Head

2. Background

Low Head lightstation is located at the head of the Tamar River, the port entry to the city of Launceston in Tasmania.
The lighthouse was constructed in 1888. In the 1920s it was decided to instal a fog alarm at the station in response to an increase in shipping and the delays caused by heavy river and sea fogs in the area.
The English company, Chance Brothers, were engaged to supply a fog horn which was shipped to Tasmania and installed in April 1929

3. Social context

Many who lived or holidayed at Low Head from the early 1930s remember the mournful sound of the fog horn.
Whilst visiting the site I met a retired farmer who clearly remembers the fog horn being operated by the keepers at Low Head which he described as '*the roar of a thousand elephants'*
Many children and adults had laid in bed comforted by the unique sound which alerted mariners they were approaching dangerous shores, unfortunately there were also many complaints about the excessive noise as the areas population grew.

4. The equipment

The fog horn is a *Chance Bros Type G Diaphone* that in its original configuration consisted of the following-
Two Reavell air compressors (1 standby)

Two 19hp Gardner kerosene engines (1 standby)
Which supplied air to two joined/tandem air receivers each with a capacity of 7.5 cubic metres to an operating pressure of 35lbs/sq.in
Pipes connect the air receivers and two large air valves. One is an operating valve and the other a sounding valve for the Diaphone.
Smaller pipes connect to relay valves which in turn control the larger ones and an air motor which controls the timing of the blasts.
An air operated timing mechanism controls operating and sounding valves which provide the unique tone of the Diaphone.
The Diaphone consists of three main parts- a piston, a cylinder and a casing.
There is also a trumpet which reinforces and directs the sound.
The Diaphone piston has two diameters. The larger driving end fits into a portion of the cylinder of corresponding size. Both the driving end of the piston and the cylinder are machined with air ports.
The smaller sized section of the piston fits into a corresponding section of the cylinder but each is machined with slits. These slits are so arranged that during each stroke of the piston the slits align opposite each other allowing air to flow from the Diaphone casing to the interior of the piston and thus to free air through the resonator.
When the piston is in operation the slits are opened and closed 180 times per second. In effect the large volume of air flowing through is cut 180 times per second which causes the sudden intense note and enormous volume of sound.
The outer casing contains an annular passage at the back of the Diaphone around which the driven air passes. A passage at the front of the casing passes the sounding air.
At the end of each blast the Diaphone piston stalls resulting in a peculiar '*grunt*' sound. This adds to the distinctiveness of the sound and greatly increases the range at which the foghorn can be heard.
The timing air motor drives two cam wheels through a gearbox with a ratio of 243.2:1. The cam wheels open and close the small air relay valves which in turn control the piston operating valve and main Diaphone sounding valve. The cam wheels were adjusted to match the flashing sequence of the original lens at Low Head.
The Diaphones character is- *Blast 1.4 secs- Silent 2.5 secs- Blast 1.3 secs- Silent 2.5 secs- Blast 1.3 secs- Silent 51.0 secs*
*Interestingly I found another of these Chance Bros timing motors belonging to AMSA at the Queenscliff Maritime Museum in Victoria.
The operating valve and sounding valve are ordinary bronze mushroom types but both are actuated by air from the timing relay valves admitted to the undersurface by a pliable rubber diaphragm. This diaphragm is expanded and lifts the mushroom off its seat and allows air to pass to the Diaphone.

5. Operation- simple explanation

The cut off valve between the compressor and the air receivers is opened
The Gardner (or electric motor) is started
When operating pressure is reached, the valve between the air receivers, the coding motor and the relay valves is opened
The original operating instructions are attached as an appendage.

6. Building

The foundations were chosen by the District Engineer and work completed on the building structure in October 1929.
The engine beds were excavated to 2'6" with their dimensions being 6' x 3'6" x 3'6"

The foundations of the engines are on solid rock approx 9” above the concrete floor level.

7. A new lease of life

In the late 1930s electricity was finally connected to the station. In 1941one of the Gardner engines was removed and replaced by a 20hp electric motor. This was done as the Gardner had a defective cylinder.
In the early 1970s increases in electronic nav aid technology meant the end for the foghorn which was decommissioned in 1973.
The reasons given at the time were-

1. Ineffective as a navigational aid
2. Nuisance to the local public
3. An expense to the taxpayer

The Regional Controllers letter (28 June 1972) also mentions ‘*the discontinuance of the fog signal would permit the immediate reduction in staff, from three keepers to only one. Conversion to unattended could be effected later with little difficulty’*

In 2000 the Low Head Progress Association decided to take on the rehabilitation of the foghorn. The Association is staffed entirely by volunteers.
Luckily the fog horn room had been sealed and remained untouched from its closure in 1973.
The volunteers found that the fog horn was remarkably well preserved. This was because the externals were totally encased in a heavy layer of paint believed to have been applied to help preserve the metal

8. Research

Before attempting to disassemble the fog horn all efforts were made to locate manuals and drawings.
The original manufacturers were no longer is business and it was determined that no similar equipment was in use anywhere else in the world.
Eventually Trinity House supplied the necessary information through their *Senior Maintenance Engineer* who found the required information in a disused shed at the Portland Lightstation in the UK.

9. Obstacles

On closer inspection it was found that a leak in the fog horn room roof had resulted in water causing surface rusting to the large rivets of one of the air receivers.
An initial report by an inspecting engineer recommended that to rectify the problem to the satisfaction of the testing authorities would be cost prohibitive, the project seemed doomed.
Eventually an engineer was found who recommended minor repairs could be made to the receiver that would satisfy the pressure vessel inspecting authorities.
A specialist welder was engaged and the three offending rivets were replaced with high tensile bolts and the work approved by an inspecting engineer.

10. Testing

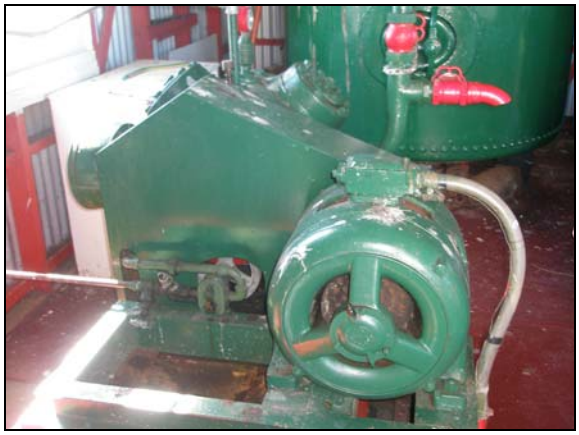
Using the No.2 electric motor (the No.1 Gardner engine had not yet been refurbished) the compressor was started and the pressure vessels brought to operating pressure.

The control valves were opened, the timing motor started and several seconds later the '*roar of a thousand elephants'* was heard again for the first time in nearly 30 years.

9. Refurbishment of the Gardner engine and the standby compressor

At this stage enquiries were made to contact a retired engineer of the *Gardner Engine Co* who in retirement had taken charge of the *Gardner Vintage Engine Register*.
The engine number, model number and other relative information were sent to him. He replied with the original works test sheets for the engine also informing that this particular model was not known to be operational anywhere else in the world.
The engine was stripped with the interior found to be in near perfect condition. Further research indicated that this type of engine was good for 500 000 hours before major overhaul, log books for the engine showed only 1200 hours use.
The engine was nearly new.
The valves were reground, oil and filters changed and new fuel and water cooling tanks fabricated.
The engine is now fully operational and operates most Sunday afternoons for visitors to the site.

	
Top engine is the refurbished Gardner The bottom (spare unit) has the electric motor in place, both compressors are Reavell	Gardner engine

	
Electric motor and spare compressor	Gardner carburettor assembly

	
Sounding valve and driving valve (upper) External trumpet is attached to upper drive valve	External trumpet with lighthouse in background

	
Timing air motor showing two cam wheels on right hand side	Air receiver No.1

Credits

I would like to thank Mr Terrence Terry of Low Head for his assistance in writing this paper. Terrence operated the fog horn for me (risking noise complaints). He also talked me through the operation of the fog horn.
Other sources of information included AMSA archived files, *Bruce Findlays* informative brochure on Low Head as well as the *Pilot Station Museum* at Low Head. Another excellent source of information is *Lost Sounds* ISBN No. 1-870325-83-4 by *Alan Renton*