


S. S. W. W.

DESCRIPTION OF PUMPING STATIONS
1921.

VOL. I

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ENGINEER.

SOUTH STAFFORDSHIRE WATERWORKS COMPANY.

PUMPING STATIONS.

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CONEYGRE PUMPING STATION.

situate at

TIPTON in the County of STAFFORDS U M M A R Y
- - - - -Total Engine Power at Station is equalto 2,000,000 gallons per 24 hours.

No. 1. Engine. Power per day = 1,000,000 Galls.
 Nos 1 and 2 Electrically Driven Pumps.
 Each equal per day to - 540,000 do

TOTAL SPECIFIED HEAD

No. 1. Engine	...	...	237.6 Feet
Electrically Driven Pumps	...	...	196 "

C O S T S

	£.	s.	d.
Land and Law Charges ...	3,744.	10.	0.
Stores and House ...	845.	5.	2.
Engine & Boiler Houses ...	1,000.	0.	0.
No. 1. Engine & Boilers ...	3,080.	18.	0.
Electrically Driven Pumps .	1,400.	12.	0.
Foundations & Transformer) House for E.D.Pumps) and Sundries.)	480.	2.	2.
Venturi Meter and Recorder.	275.	0.	0.
	£ 10,826.	7.	4.

Station Commenced - 1864.

Station Completed - 1920.

LAND (7 acres, 2 roads, 28 poles).

Purchased in 1871 from the
Earl of Dudley.

Level of B.H.F. above O.D.	...	464.82 Feet
Top water level of Cawney Hill		
Tank above O.D.	...	831.15 "

NOTE:- The land includes Pumping
Station, Stores and
Reservoir. Rent of Wharf
per annum - £10.

CONTRACTORS

Unable to trace Contractors of
Engine and Boiler Houses, also
Stores and House.

ENGINES

No. 1. Steam Engine.

J. Watt & Co., Birmingham 1906 - 1907

BOILERS

H & T Danks Ltd., Netherton, 1896.

ELECTRICALLY DRIVEN PUMPS, &c.

Rees Roturbo Co. Ltd.,

Wolverhampton.

1918.

C O S T S

	<u>£</u>	<u>s</u>	<u>d</u>
Land and Law Charges ...	3,744.	10.	0
Engine and Boiler Houses ...	1,000.	0.	0
Stores and House ...	845.	5.	2
No. 1. Engine ...	2,798.	15.	0
Two Boilers ...	282.	3.	0
Foundations and Transformer)			
House for electrically)	480.	2.	2
driven Pumps and sundries)			
Ⓜ Ⓜ Electrically Driven Pumps ..	1,400.	12.	0
Venturi Meter & Recorder ...	275.	0.	0

<u>TOTAL COST</u>	£ 10,826.	7.	4
	=====		

Ⓜ Ⓜ DETAIL OF COST OF ABOVE PUMPS

Amount of Rees Roturbo Company's)			
Tender, and advances under)	£1,140.	0.	0.
Contract, etc.)			
Additional Wiring ...	86.	0.	0.
Cable Laying by Midland)			
Electric Corporation)	174.	12.	0.

	£ 1,400.	12.	0.
	=====		

NOTE

This Station is a Re-pumping Station :-
 The Plant draws its water from a main
 at a pressure of 90 lbs per square inch,
 and delivers it into a 12 inch main
 controlled at the present time by Cawney
 Hill Tank, about 1½ miles distant.

NO. 1. ENGINE. HOUSE.

Internal dimensions. Length	..	55 Ft - 9 Ins.
ditto Width	..	25 Ft. - 0 Ins.
Depth of Foundations	..	8 Ft - 6 Ins.

BOILER HOUSE

Internal dimensions. Length	..	51 Ft - 6 Ins.
ditto Width	..	43 Ft - 6 Ins.

NO. 1. ENGINE

Horizontal Compound Tandem
Rotary Surface Condensing
Pumping Engine.

CAPACITY.

Net quantity per 24 hours
equals 1,000,000 gallons at
a speed of 180 ft. per minute.

Speed per minute	22 $\frac{1}{2}$ Revs.
------------------	-----	----	------------------------

SPECIFIED HEAD

Average Suction pressure on Main.		90 Lbs per sq inch
" Delivery ditto		193 ditto
Total head on Pumping Main ,) including friction)		237.6 Feet
Pump Horse Power at 22 $\frac{1}{2}$ revs.) per minute)		50.
Diameter, Steam Cylinders, H.P.		15 Ins.
" ditto L.P.		26 "
Stroke of Engine	...	4 Feet

Cylinders steam jacketted.

PISTON RINGS.

Mather & Platt's Springs and Rings.

Diameter, Piston Rods.	H.P. Front End.	3	Ins.
"	do Centre.	4	"
"	do L.P. Back End.	3	"

PISTON ROD PACKINGS.

Made by the United Kingdom
Metallic Packing Syndicate
Limited, of Liverpool.

ENGINE VALVE GEAR.

Valves of Corliss type, worked
from Crank Shaft by eccentrics
and levers, and without auto -
matic release.

Diameter, Connecting Rod Crank Pin,	6	Ins.
" Connecting Crosshead Pin,	4	"
" Crank Shaft Bearings,	10	" and
	9	"

AIR PUMP

Edward's Independent Pump.

Diameter, Steam Cylinder	...	5	Ins.
Stroke of Engine	...	8	"
Diameter, Air Pump	...	10 $\frac{1}{2}$	"
" Bucket Rod	...	1 $\frac{3}{4}$	"
No. Valves on Delivery Valve Plate,		5	"
<u>Valve - Dermatine type</u>			
Diameter, Inlet Pipe	...	4	"
" Outlet "	...	3 $\frac{1}{2}$	"

AIR PUMP (Continued).

NOTE :- The Air Pump was originally driven by a chain. Steam Cylinder, etc, were fitted by W.H.De Ritter & Co., of London, in 1916.

FORCE PUMP

Double-Acting Piston Pump driven by L.P.Piston Tail Rod.

Diameter, F.P.Piston	...	11 $\frac{1}{4}$ Ins.
Stroke ditto	...	4 Feet.
Diameter F.P.Rod (Front End only)		3 $\frac{1}{8}$ Ins.
Gallons discharged per double stroke)		33.096
Multiplier given to Foreman		33

FORCE PUMP VALVES

Cast Iron Double Beat with Gutta Percha Beats.

Number, Suction Valves	...	2
" Delivery "	...	2
Diameter, Seat of Suction Valves		15 Ins.
" " Delivery "		17 "
Free lift of Valves	...	$\frac{3}{4}$ "

FLYWHEEL. (CAST IRON)

Diameter	...	16 Feet
Width of Rim ..	...	8 $\frac{1}{2}$ Ins.
Inside diameter of Boss	...	12 "
Weight of Wheel Rim	...	8 Tons.

CONDENSER

Enclosed type with tubes expanded
into tube plates with water of
main passing on outside of tubes.

Cooling Surface	...	...	135 Sq. Ft.
Number Ordinary Tubes	.	...	76
Length	do	...	3 Ft - 7 $\frac{1}{2}$ Ins
Diameter	do	...	2 Ins (Ext.)
Thickness	do	...	14 B.W.G.
Number, Stay Rods	...	...	4
Pitch of Tubes	...	...	2 $\frac{1}{2}$ Ins.
Diameter, W.I. Stay Rods	...	...	1 $\frac{1}{4}$ "
"	Tube Plates ..	...	2 Ft - 9 $\frac{1}{2}$ Ins
Thickness	do	...	1 In.
Distance apart over Plates	...	...	3 Ft - 7 Ins.
Diameter, Exhaust Inlet	...	...	6 Ins.
"	Outlet	...	4 "

AIR VESSELS

VESSEL ON SUCTION MAIN. (Cast Iron)

Total height, inside	...	...	12 Ft - 4 Ins
Diameter	"	...	2 Ft - 3 $\frac{1}{2}$ Ins
Height above Branches	..	...	9 Ft - 5 $\frac{3}{4}$ In
Thickness of Metal	...	...	1 $\frac{3}{8}$ Ins.
Working pressure per square inch	...	...	90 Lbs

VESSEL ON DELIVERY MAIN. (Cast Iron)

Total height inside	...	...	17 Ft - 6 In.
Diameter	"	...	2 Ft - 1 $\frac{1}{2}$ In
Height above Branches	..	...	15 Feet.
Thickness of Metal	...	...	2 $\frac{1}{2}$ Ins.
Working pressure per square inch	...	...	193 Lbs.
Capacity above Branches	...	...	51.77 C. Ft.
Total Capacity	...	...	60.58 "

STEAM SEPARATOR ON STEAM MAIN.

Made by Holden & Brooke Ltd.
Manchester.

Diameter of Inlet to Separator ... 4 Ins.

AIR COMPRESSOR.

Single-Stage, Westinghouse
type, Class "F", Size 8 / 4 Ins.

Steam Inlet, dia. ...	...	1 In
Exhaust Steam Outlet, dia. ...	...	1 $\frac{1}{4}$ "
Air Delivery, dia. ...	...	$\frac{5}{8}$ "

Wording on name plate as under :-

" The Westinghouse Brake Co. Ltd.
York Road, Kings Cross, London,
No. 38790.

Made in London Works, No. 13909."

FEED WATER HEATER ON EXHAUST LINE.

Special No. 6. Simplex Berryman
Heater, made by Joseph Wright &
Co., Tipton.

Heating Surface	...	43 Sq. Ft.
Inside diameter	...	1 Ft - 9 $\frac{1}{2}$ Ins.
Diameter, Inlet & Outlet for Exhaust,		6 Ins.
" Tube Plate ..	...	2 Ft - 1 $\frac{1}{2}$ Ins.
" Inlet & Outlet for Feed)		2 Ins.
Water)		

Body of Heater - Mild Steel.

MAIN BRAKE ON STEAM RANGE.

Diameter, M.B. Piston	...	3 Ins.
" (outside) Brake Spring	...	5 $\frac{3}{8}$ "
" (inside) ditto	...	5 $\frac{3}{8}$

MAIN BRAKE (Continued)

Section of Brake Spring	...	1 In X 11/32 In.
Free length of do	...	27 Ins.
Length - when loaded to 160 lbs per square inch -		12 "
Length - when loaded to 193 lbs per square inch -		9 "
Diameter, Copper Vacuum Spoiler) Pipe)		3/4 "
Throttle Valve on Steam Range to) Brake)		6 1/2 "

STEAM BOILERS.

Two Boilers of the "Cornish"
type made by H & T Danks of
Netherton.

Diameter,	...	...	5 Feet.
Length	...	...	20 "
Thickness of Shell Plate	...		3/8 In.
" End Plate	...		1/2 In.
Diameter, Internal Flue	...		2 Ft - 7 Ins.
Thickness, Flues. Front End Sec'n.			1/8 In.
Intermediate "			3/8 In.
Back End "			1/2 In.
Size of Circular Manhole	...		16 Ins. (dia.)
Steam pressure per square inch .			80 Lbs.
Total Heating Surface	...		355 Sq. Ft.
" Grate "	...		13 Sq. Ft.

MOUNTINGS ON EACH BOILER .

Diameter, One Junction Stop Valve,		4 Ins.
" " Dead Weight Safety "		2 Ins.
" " Single Lever do		2 1/2 Ins.
" " Feed Check Valve.		2 Ins.
" Main steam Range over) Boilers)		4 Ins

One Anti-Priming Pipe for Junction Valve.

BOILER FEED PUMPS 1.

Made by Lee Howl & Co. of Tipton.

Type - Vertical "Tipton".

Diameter, Steam Cylinder	...	3 $\frac{3}{4}$	Ins.
" Water end	...	2 $\frac{1}{2}$	"
Stroke	... ..	9	"
Diameter, Suction	... ..	2	"
" Delivery	... ..	2	"
Delivery, Capacity per hour	...	290	Gallons.

CAST IRON FEED TANK

3 Ft - 0 Ins X 2 Ft - 3 Ins X 2 Ft - 6 Ins.

Copper Coil fixed in Tank to
heat Feed Water.

FITTINGS, &c.

One "Dewrance" make Stop-Valve
on Engine - 3 $\frac{1}{2}$ Ins dia.

SIGHT FEED LUBRICATOR ON ENGINE

Made by Hunt & Mitton, Birmingham.

Number of Feeds	3
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COUNTER.

Of the Harding's 7 Figure Type.
Made by - T.Glover & Co., London.

PRESSURE GAUGES.

Steam Vacuum & Water Pressure, all
of the Open Dial Type. Made by -
Schaffer & Budenburg, Manchester.

Diameter	10	Ins.
----------	-----	-----	-----	----	------

Official Trial of this Engine was made on
25th April, 1907.

Duration of Trial	...	12 Hours.
Mean Delivery Pressure	...	193 Lbs.
" Suction "	...	91 "
Total Indicated Horse Power		72
Total Water pumped per 24 hours (5% Slip allowed).		1,020,202 Gallons
Average Total Head against Pumps		235.3 Feet.
Average Pump Horse Power	..	53.3
Mechanical Efficiency	...	74%
Duty per 1120 lbs. of Steam (Slip neglected)		97,550,000. Ft.) Lbs.)
Evaporation per lb. of Slack		4.6 Lbs.

NOTE:- The guaranteed duty of
 105,000,000 Ft. Lbs. per
 1120 lbs. of steam was
 not obtained at this test.

DUPLICATE PLANT.

Two Electrically Driven Pumps.

Maker's Order Number - F.2371.

PUMP CAPACITY.

The Contractors guaranteed each Unit should be capable of giving a duty of 22,500 gallons per hour (540,000 gallons per 24 hours), against a pressure of 165 lbs. per square inch on Delivery side of Pump, and 80 lbs. on Inlet side - giving a difference of pressure of 85 lbs. per square inch, equal to a head (including friction) of 196 Feet.

Specified Power of Plant ensured delivery of 1,000,000 gallons per 24 hours.

Specified Suction Pressure ... 80 to 120 Lbs.
 " Delivery " ... 160 to 165 "

Speed per minute ... 1450 revs.
 Pump Horse Power of each unit based on 540,000 galls at 196 ft. = 22.25.
 " " " " " " " " 777,600 " " 127 " = 20.8.

PUMPS.

Made by Rees Roturbo Manufacturing Co.,
Wolverhampton. type - Rees Roturbo
Patent Pressure Chamber Pumps, 2 Stage.
Maker's Number on Pumps - 7546 & 7547.

Diameter, Impellers, ... 10 Ins.
 " Suction & Delivery)
 Branches) 6 "

DUTY OF EACH PUMP.

At 196 Ft. Head, 1450 revs. .. 22,500 G.P.H.
 " 127 do do .. 32,400 G.P.H.
 Diameter, Sluice Valves on Branches, 6 Ins.

PUMPS

Diameter, Sluice Valves on Main ... 12 Ins.
" Retaining Valve fitted on)
Delivery Main.) 12 "

MOTORS

Maker's Order No. F. 2372.

The Pumps are direct driven by
Motors supplied by the British
Thomson Houston Co. Ltd., Rugby.

Motors are of the B.T.H. Induction
Protected Slip Ring Type (I.X.Q) for
alternating current.

Class	...	...	66
Poles	...	...	4
B.H.P.	...	...	40
Revolutions per minute ..			1450
Voltage	...	...	200
Periodicity ..	...	...	50
Phase	...	...	2
Amperage	...	...	98.5

STARTERS.

Tramway type - T.502.

OIL SWITCHES 2

O. Form, D.L. on Form, J. Pedestals.

RESISTANCES (C.G. Protected)

All the above electrical gear was
supplied by The British Thomson-
Houston Company.

COUPLINGS -

Between Motors and Pumps of the Pin type.

Diameter, Pump Shaft	...	2 Ins.
" Motor "	...	$2\frac{3}{16}$ Ins.

ELECTRIC CURRENT.

The Electric Current is obtained from the Midland Electric Corporation for Power Distribution Limited, and is transformed at the Pumping Station in the Transformer House to a voltage of 200 volts, per phase in two phase alternate currents of 50 periods per second.

The Power Company's Meter for registering the consumption of current is on each phase.

A Lighting Meter is also fixed for registering the current consumed by lighting.

The Electrically driven Duplicate Plant first started pumping into the main on 27th May, 1919.

VENTURI METER AND RECORDER.

A 1912 type Recorder was installed at the same time as the electrically driven Pumps on the 12 inch Pumping Main, and registers the quantity of water pumped, also the quantity pumped by the Steam Engine.

Company's Order Number, dated 6th April, 1918 - 609.

Range of Recorder	...	1 to 20. ?
Minimum Registration per Hour,		5,000 gallons.
Maximum	ditto	70,000 "