


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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HUNTINGTON PUMPING STATIONsituats nearCANNOCK in the County of STAFFORD.S U M M A R Y
- - - - -

Total Engine Power at this
Station is equal to 3,000,000
Gallons per 24 hours,

No. 1. Engine. Power per day = 1,500,000 Gallons.
No. 2. Engine. ditto = 1,500,000 do

TOTAL SPECIFIED HEAD = 500 Feet.

C O S T S

	<u>£.</u>	<u>s.</u>	<u>d.</u>
Land and Law Charges,	3,122.	5.	6.
Well and Sinking Borehole,	9,623.	6.	8.
Tunnel and Boreholes,	1,083.	0.	1.
Engine and Boiler Houses,	9,894.	3.	3.
Cottages ...	1,816.	10.	5.
Engines and Boilers,	14,336.	18.	0.
	<hr/>		
	£ 39,876.	3.	11.
	<hr/> <hr/>		

Station Commenced - 1875

Station Completed - 1879

LAND (3 Acres)

Leased from Lord Hatherton in
November, 1875

Level of E.H.F. above O.D.	539.79 Feet
Lease for	999 Years

NOTE:-

£10 per annum is paid for the land upon which the Pumping Station stands.

£1 per annum is paid as Wayleave for land at Shoal Hill in respect of the pipe between the two places.

CONTRACTORS.WELL

E. Timmins & Sons,	1876 - 1878
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BOREHOLE

F. Coulson ...	1879
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TUNNEL

W.H.Hughes & Co.,	1886
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BUILDINGSEngine & Boiler Houses

W. Trow & Sons, ...	1877
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Cottages.

W. Trow & Sons ...	1877
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ENGINES

Nos. 1 & 2 Engines,

J. Watt & Co., ...	1877
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BOILERS (4)

J. Watt & Co ...	1877
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<u>COSTS.</u>	<u>£</u>	<u>s</u>	<u>d</u>
Land & Law Charges ...	3,122.	5.	6
Making Well & Sinking Borehole,	9,623.	6.	8
Tunnel	1,006.	3.	5
Boreholes in Tunnel ...	76.	16.	8
Engine & Boiler Houses ...	9,894.	3.	3
Cottages	1,816.	10.	5
Engines 1 & 2, and 4 Boilers,	14,336.	18.	0
<hr/>			
<u>TOTAL COST</u>	£ 39,876.	3.	11
<hr/> <hr/>			

ENGINE HOUSE

Internal Dimensions. Length ,	33 Ft - 0 Ins.
Width,	28 Ft - 0½ Ins.
Height to top of Wall Plate,	40 Ft - 0 Ins.
Depth of Foundations ...	19 Ft - 6 Ins.

BOILER HOUSE

Internal Dimensions. Length,	50 Ft - 11 Ins.
Width,	42 Ft - 9 Ins.
Level E.H.F. to <u>Firing Floor</u>	17 Ft - 6 Ins.

WELL.

Diameter	16 Ft - 9 Ins.
Total Depth from E.H.F. ...	196 Feet

BOREHOLE IN WELL

Diameter	3 Ins.
Depth from bottom of Well ..	76 Ft - 4½ Ins.
Total depth Well & Borehole combined from E.H.F.	272 Ft - 4½ Ins.

TUNNEL OR HEADING IN WELL.

<u>5 Ft. deep</u> X <u>3Ft - 6" Wide</u> X <u>467 Ft - 5½" Long.</u>	
Floor of Heading from E.H.F.	137 Ft - 3 Ins.

HUNTINGTON P.S.

BOREHOLES IN TUNNEL

No. 2.	Diameter, ...	...	6 Ins.
	Depth	...	74 Feet
No. 3.	Diameter	...	3 Ins.
	Depth	...	105 Feet

ENGINES

Nos 1 and 2 Engines are of the same
Size and Capacity in every respect.
Cornish Expansion Condensing Single-
Acting Beam Engines, working Well
Pumps and Force Pumps.

CAPACITY

Net quantity pumped equals 1,500,000
Gallons per 24 hours at a speed of 8
double strokes per minute.

SPECIFIED HEAD.

Specified Depth of Well	...	135 Feet
" Head on Pumping Main (including friction)		365 Feet
	TOTAL HEAD	500 Feet
Engine Speed per Minute	...	144 Feet
P.H.P. @ 8 Double Strokes per Min.		158.

RIISING MAIN OR LIFTS

Lifts, Distance apart in Well	...	12 Ft - 6 Ins.
Number to each Engine	...	1
Diameter Cast Iron Pipes		22 $\frac{3}{4}$ Ins.
Length	...	9 Feet
Thickness, Metal of Pipes,		$\frac{7}{8}$ In. to 1 $\frac{1}{8}$ In
Diameter, Flanges	...	2 Ft - 7 Ins.
Thickness do	...	1 In. to 1 $\frac{1}{4}$ Ins

RISING MAINS OR LIFTS (Continued)

Each Lift consists of 17 Lengths of
9 Feet Pipes, and two short lengths ,
each respectively 5 Ft - 1 In., and
6 Ft-7 In., with Working Barrel, Clack
Box, Snore Piece and also top Guide
Length.

No. 1. Lift is 3Ft-9 Ins shorter than
No. 2. These lifts were altered in
length in June, 1901.

WORKING BARREL.

Diameter	22 Ins.
Length	11 Ft - 3 Ins.
Thickness of Metal	1½ Ins.
Diameter of Flanges	2 Ft - 7 Ins.

CLACK BOX

Diameter	22½ Ins.
Length	7 Ft - 9 Ins.
Thickness of Metal	1½ Ins.

SNORE PIECE.

Diameter, (Smallest part)	18½ Ins.
Length (Overall)	2 Ft - 7 Ins.
Diameter, Flange on Snore Piece .	25 Ins.

WELL PUMPS

Single-Acting Pumps, operated from
end of Well Pump Beam of Engine.

WELL PUMP BUCKETS & CLACKS

Cast Iron Hat Band Buckets and Clacks

Diameter, W.P. Bucket	22 Ins.
Stroke ditto	9 Feet

W.P. BUCKETS & CLACKS (Continued)

Number, Tiers of Hat Bands ...	4
Inside Diameter, 1st India Rubber Band)	12 Ins.
2nd do	14 Ins.
3rd do	16 Ins.
4th do	18 Ins.

SUCTION VALVES & CLACKS.

Diameter, Clack top of tapered Seat,	20 $\frac{3}{4}$ Ins.
ditto bottom do	19 $\frac{3}{4}$ Ins.
Number Tiers of Hat Bands ...	4
Inside Dia. 1st India Rubber Band,	12 Ins.
2nd do	14 Ins.
3rd do	16 Ins.
4th do	18 Ins.
Hat Bands, Thickness ...	$\frac{7}{8}$ In.
Diameter, Well Pump Rods ...	3 Ins.
Coupling between Pump Rods ...	Parallel.
Turned part of Rod inside Coupling,	3 $\frac{3}{4}$ In. dia.

FORCE PUMPS.

Single-Acting Plunger Pump operated
from end of Engine Beam with Weight
Box on top of Plunger.

Diameter, Plunger ...	21 Ins.
Stroke do ...	9 Feet
Gallons discharged per double stroke,	135.2
Multiplier given to Foreman ...	135
Excess of discharge of Well Pump } over Force Pump }	9.75 %
Diameter, Inlet and Outlet Branches on F.P. Valve Boxes ...	22 Ins.

FORCE PUMP VALVES.

Cast Iron Hat Band Valves.

Number Suction Valves to each) Engine)	1
" Delivery ditto	1
Diameter, Seat of both Valves,	3 Ft - 0 $\frac{1}{4}$ Ins.
Number Tiers of H.B.'s on each) Valve)	5
Inside Dia. 1st India-Rubber) Band)	2 Ft - 4 Ins.
2nd do	2 Ft - 6 Ins.
3rd do	2 Ft - 8 Ins.
4th do	2 Ft - 10 Ins.
5th do	3 Feet
Thickness of Bands ...	$\frac{7}{8}$ Ins.
Depth of do ...	8 $\frac{1}{8}$ Ins.

NOTE:-All Hat Bands of
Suction and Delivery Valves
are the same diameters.

Steam Cylinder, each Engine. dia.	65 Ins.
Stroke of Engine ...	10 Feet
Diameter Piston Rod of each) Engine)	6 $\frac{3}{4}$ Ins.

PISTON RINGS.

Broad Cast Iron Packing Ring
fitted with coach Springs.

PISTON ROD PACKINGS

Ordinary soft type.

CYLINDERS

Steam Jacketted.

PISTON RINGS

(See above).

ENGINE VALVE GEARCornish Gear with Drop Valvesoperated by Plug Rods.STEAM NOZZLES.

Diameter, Steam Valve to Cylinder,	14 $\frac{5}{8}$	Ins in Seat
Equilibrium Valve	14 $\frac{5}{8}$	Ins do
Governor Valve ...	14 $\frac{5}{8}$	Ins do
Lift of above 3 Valves ...	1 $\frac{7}{8}$	Ins.
Diameter, 3 Valve Spindles .	1 $\frac{3}{8}$	Ins.
" Exhaust Valve ...	17 $\frac{3}{4}$	Ins do
Lift, ditto ...	2 $\frac{1}{4}$	Ins.
Diameter, Exhaust Valve Spindle,	1 $\frac{1}{2}$	Ins.

AIR PUMP.One Single-Acting Vertical Pumpoperated from Air Pump Gudgeonon Engine Beam.

Distance of A.P.Gudgeon from centre Gudgeon of Engine Beam,	8 Ft - 2 Ins.
Diameter	32 Ins.
Stroke	4 Ft - 9 Ins.
<u>Valves - India Rubber</u>	
<u>Foot Valve - Flap Valve type.</u>	
Diameter, Bucket Valve ...	2 Ft - 3 Ins
" Head Valve ...	2 Ft - 9 $\frac{1}{2}$ Ins.
" Bucket Rod ...	3 Ins.
Size of Inlet	6" X 36 Ins.
Diameter, Outlet ...	9 Ins.

CONDENSERS.Open type with Tubes expandedinto Tube Plates, Condensersplaced in Force Pump SuctionTank

CONDENSER. (No. 1. Engine)

This Condenser was re-tubed in December 1906 with 60 Brass Tubes in lieu of the original 392 W.I. Tubes, the remaining 232 holes being plugged with C.I. Plugs.

Cooling Surface	...	...	462 Sq. Ft.
Ordinary Brass Tubes. Number	...	...	160
(Ext.) Diameter	..	...	1 ⁹ / ₁₆ In.
Length	...	...	6 Ft - 1 ³ / ₄ Ins.
Thickness	.	...	16 B.W.G.
W.I. Stay Tubes. Number	...	...	28
(Int) Diameter	..	...	1 ¹ / ₂ Ins.
Length	...	...	6 Ft - 4 Ins.
Pitch of Tubes	...	...	3 ¹ / ₈ " X 2 ⁵ / ₄ Ins.
Diameter, Tube Plates	...	...	6 Ft - 1 In.
Thickness do	...	...	⁵ / ₈ In.
Distance apart over Tube Plates	.	...	6 Ft - 1 ¹ / ₂ Ins.
Diameter, Exhaust Inlet	...	...	16 ¹ / ₂ Ins.
Size " Outlet	...	...	6" X 36 Ins.
Number, Stay Bolts in nest of Tubes,			5
Diameter ditto	...	...	1 ⁵ / ₈ In. W. Iron.
Length ditto (Overall)			6 Ft - 4 ¹ / ₂ Ins.

CONDENSER (No. 2. Engine)

This Condenser was re-tubed in February, 1909 with 200 Brass Tubes, the remaining holes of the original 392 Wrot. Iron. Tubes being plugged.

Cooling Surface	...	...	560 Sq. Feet
Ordinary Brass Tubes. Number	...	...	200
(Ext.) Diameter	..	...	1 ⁹ / ₁₆ Ins.
Length	...	...	6 Ft - 1 ³ / ₄ Ins.
Thickness	.	...	16 B.W.G.

CONDENSER (No. 2. ENGINE)
(Continued)

ALL other dimensions and particulars
are as for Engine No. 1.

DELIVERY AIR VESSEL (WROT IRON)

Total Height (inside(	...	24 Ft - 10 $\frac{1}{2}$ Ins.
Diameter do ...	...	5 Feet
Height above Branches	...	21 Ft - 11 $\frac{1}{2}$ Ins.
Thickness of Metal ...	...	$\frac{5}{8}$ In.
Working pressure, per square inch,		130 Lbs.
Test " do		260 Lbs.
Capacity above Branches	...	422 C. Feet.
Total Capacity	...	479 C. Feet

FEED WATER PUMPS.

One Plunger Type Pump to each Engine
operated from Engine Beam.

Distance Feed Pump Gudgeon from centre)		
Gudgeon on Engine Beam	)	4 Ft - 3 $\frac{1}{2}$ Ins.
Diameter, Plunger ...	...	5 $\frac{1}{2}$ Ins.
Stroke of Pump ...	...	2 Ft - 6 Ins.

AIR SUPPLY PUMPS TO AIR VESSELS

One Plunger Type Pump to each Engine
operated from Engine Beam

Diameter, Plunger ...	...	7 Ins
Stroke ...	...	2 Ft - 6 Ins.

ENGINE BEAM.

Diameter, Bearings of Centre Gudgeon,		12 Ins.
Length ditto		14 Ins.
Diameter, Bearings of Cylinder & Main)		
Pump Gudgeons.	)	8 Ins.
Length, Bearings of Cylinder & Main		
Pump Gudgeons.		7 Ins

ENGINE BEAM (Continued)

Distance, Cylinder from centre) Gudgeon)	17 Ft - 2.45 Ins
" Main Pump ...	15 Ft - 6.005 "

WELL PUMP BEAM.

Diameter, Centre Gudgeon ...	5 $\frac{1}{4}$ Ins.
Length, ditto ...	7 Ins.
Diameter, Gudgeons on end of Beam) for Well Pump and over Steam) Cylinder ...	4 Ins.
Rod for connecting Engine and Well) Pump Beams.	
Diameter of Brasses ...	4 Ins.
Length between centres of Brasses) on rod. ...	5 Ft - 6 Ins.

STEAM BOILERS (LANCASHIRE) ... 4Made by James Watt & Co, Birmingham.

Diameter ...	7 Feet
Length ...	32 Feet
Thickness of Shell Plates ...	7/16 In.
" End do ...	9/16 In.
Diameter, Internal Flues.	
Front End ...	2 Ft - 8 Ins.
Back End ...	2 Ft - 8 Ins.
Thickness, Flue Plates over Fire) Grate)	9/16 In.
" other parts of Flue,	$\frac{1}{2}$ In.
Diameter, Manlid Dome ...	2 Feet
" Steam Dome ...	3 Feet
Size, Oval Manlid ...	15" X 12 Ins.
Steam Pressure per square inch	30 Lbs
Total Heating Surface ...	976 Sq. Feet.

MOUNTINGS ON EACH BOILER

One Junction Stop Valve with two) Lever Dead Weight Safety) Valves attached, Stop) Valve fixed on top of Steam) Dome)	8½ Ins. dia.
One Feed Water Check Valve.	
One Blow Down Valve	2½ Ins. dia.
Two sets of Water Level Gauges ..	¾ In. dia.
One Steam Pressure Gauge.	

FITTINGS

One Steam Trap of Lancaster & Tonge's) Bucket type on Drains from Main) Steam Range)	1 In. dia.
Height Delivery Pressure Gauges from) E.H.F.)	4.33 Feet

ENGINE TRIALS.

NO. 1. ENGINE.

16TH NOVEMBER, 1894.

24 HOURS TEST

Duty of Engine per cwt of slack) consumed)	34,526.324 Ft. Lbs.
Pump Horse Power	44.98
Indicated do	53.57
Slack consumed per P.H.P. per hour,	7.6 Lbs.
ditto I.H.P. do	6.4. Lbs.
Mechanical Efficiency ...	83.9 %

NO. 2. ENGINE

22ND NOVEMBER, 1894

24 HOURS TEST.

Duty of Engine per cwt of Slack) consumed)	38,141,569 Ft. Lbs.
Pump Horse Power	45.27
Indicated do	55.36
Slack consumed per P.H.P. per hour,	7.08 Lbs.
ditto per I.H.P. do	5.79 Lbs
Mechanical Efficiency ...	81.7 %