


S. S. W. W.

DESCRIPTION OF PUMPING STATIONS
1921.

VOL. I

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ENGINEER.

SOUTH STAFFORDSHIRE WATERWORKS COMPANY.

PUMPING STATIONS.

<u>Index.</u>	<u>Page.</u>
Ashwood	1
Bourne Vale	31
Brindley Bank	47
Cawney Hill	61
Coneygre	68
Fradley	82
Hinksford	93
Huntington	106
Lichfield	118
Maple Brook	139
Moors Gorse	159
Pipe Hill	171
Romsley	196
Shavers End	204
Shenstone	210
Springs Mire	229
Trent Valley	246
Winshill	268
Wood Green	277

and supplementary
pages 156 A & J.

SHENSTONE PUMPING STATION

situate at

SHENSTONE in the COUNTY of STAFFORD

S U M M A R Y
- - - - -

Total Engine Power at Station is equivalent to -
2½ Million Gallons per 24 hours.

No.1.Engine Power per 24 hours	=	1,500,000	Gallons.
No.2. do do	=	1,000,000	"
<u>Total Specified Head</u> - No.1.Engine,		660	Feet
No.2.Engine,		560	"

C O S T S

		<u>£.</u>	<u>s.</u>	<u>d.</u>
Land and Law Charges	...	1,017.	8.	10.
Sinking Test Borehole	...	141.	1.	7.
Making Well	... ..	2,936.	10.	8.
Sinking Borehole in Well	...	394.	10.	1.
Sinking Borehole in Field	...	614.	1.	6.
Making Heading	... ..	1,771.	2.	2.
Engine and Boiler Houses	...	3,787.	6.	4.
Cottages	... ..	1,533.	12.	4.
Engines and Boilers	...	11,909.	1.	9.
VENTURI RECORDERS		<u>1,065</u>	<u>0.</u>	<u>0.</u>
TOTAL COST -		£ 25,169.	15.	3.

PUMPING STATION commenced 1890.

(finally) completed 1908.

C O S T S

	<u>£</u>	<u>s</u>	<u>d</u>
Land and Law Charges ...	1,017.	8.	10.
Sinking Test Borehole ...	141.	1.	7.
Making Well ...	2,936.	10.	8.
Sinking Borehole in Well ...	394.	10.	1.
Sinking Borehole in Field ..	614.	1.	6.
Heading - 263 yards ...	1,771.	2.	2.
Engine and Boiler Houses (Including new Boiler House, £102.5.1.) ...	3,787.	6.	4.
Cottages ...	1,533.	12.	4.
1st Engine (No. 2.) and three Boilers ...	} 11,909.	1.	9.
2nd Engine (No.1) .			
No. 4. Boiler ...			
(Total cost of Engines and Boilers, - £11,909. 1. 9.)			
<u>VENTURI RECORDERS</u>	1,065.	0.	0.
<u>TOTAL COST</u>	<u>£ 25,169.</u>	<u>15.</u>	<u>3.</u>

ENGINE HOUSE

Internal Dimensions - Length,	58 Feet
do Width,	26 "
Height to top of Wall Plate,	23 "
Depth of Foundations ...	11 "

BOILER HOUSE

Internal Dimensions - Length,	58 Ft - 8 Ins.
do Width,	44 " - 6 "

WELL.

Diameter of Well 12 Feet.
 Total depth of well from E.H.F. 131 "
 Top of well from E.H.F. ... 13 " - 1 In.
 Diameter of Borehole in Well ... 15 Ins.
 Lined with perforated Steel Tubing, 13 " int. dia.
 Total depth lined (perforated ") 201 Ft. from E.H.F.

Lined with plain tubing 13 In. dia.
 to a further depth of 20 $\frac{1}{2}$ feet
 making total depth from E.H.F. 221 Ft - 6 Ins.

1ST ENGINE - NO 2. (Small Engine).

NO. 2. ENGINE.

Builder's Order Number ... 4885.
 Centres of Rising Mains of Engine 4 Ft - 2 Ins.
 Diameter of Pipes of Rising Main, 15 Ins.
 Length ditto ... 9 Ft.
 Thickness of metal of Pipes .. $\frac{7}{8}$ In.
 Diameter of Flanges ... 21 $\frac{5}{8}$ "
 Thickness do ... 1 $\frac{1}{2}$ "

RISING MAINS.

Each R.M. or lift consists of 15
lengths of 9 Ft. pipe, and one
of 6 Feet, Working Barrel,
Suction Valve Box, Suction Pipe,
Top Guide Length and Closing Length.

C. I. WORKING BARREL.

Diameter 14 Ins.
 Length 6 Ft - 6 Ins.
 Thickness 1 $\frac{3}{8}$ Ins.
 Diameter of Flanges ... 21 $\frac{5}{8}$ "

SUCTION VALVE BOX

Diameter (narrow part)	...	15 Ins.
Length	...	4 Ft. - 6 Ins
Thickness of Metal	...	1 $\frac{1}{8}$ In.

CAST IRON SNORE PIECE.

Diameter (smaller part)	...	12 Ins.
Length	...	2 Ft. - 6 Ins.
Number of Holes ..	...	300
Diameter of Holes	...	1 In.

SUCTION LENGTH OF PIPE.

Diameter of Suction Pipe	...	12 Ins.
Length do	...	6 Ft.
Diameter of Flanges	...	18 $\frac{3}{4}$ Ins.

ENGINE.

Compound Horizontal Tandem

Differential Surface -Condensing.

CAPACITY OF ENGINE.

Specified quantity per 24 hours

at 140 feet per minute ... 1,000,000 Gallons.

SPECIFIED HEAD

Specified depth of Well	...	180 Feet
Head on Delivery Main (including friction)		380 "
TOTAL SPECIFIED HEAD		560 "
Pump Horse Power at 140 ft. per min.		118
Double strokes per minute		14
Diameter of H.P. Cylinder	...	27 Ins
do L.P. "	...	50 "
Stroke of Engine	...	5 Feet .

Cylinders steam jacketted.

SHEENSTONE P.S. (NO. 2. ENGINE)

215

PISTON RINGS.

Rings and Springs - Made by:-
Lancaster & Tonge.

PISTON ROD PACKINGS.Soft Packings.DIAMETER OF PISTON RODS.

Front End	H.P.	...	4	Ins.
Centre		...	5 $\frac{1}{2}$	"
Back End		...	4	"

ENGINE VALVE GEAR.

Valves to be actuated in
accordance with Davey's
Patents. To be steam
driven. Slide Valves
fitted with with Meyer's
cut off and adjustable by hand.

DIFFERENTIAL GEAR.

Steam Cylinders, diameter,	9	Ins.
Stroke	9	"
Diameter of Water Cylinder	8	"
Stroke of Gear ...	9	"
Diameter of Pausing Cylinder	4	"

Piston Ring in Steam CylinderBuckley Type, No. 2.

Diameter of Steam Piston Rod,	2	"
" Water do	2 $\frac{1}{8}$	"

AIR PUMPS

Two Single-Acting Vertical Pumps
actuated by lever from Compensating
Discs.

AIR PUMPS continued

Diameter	...	...	14	Ins.
Stroke	...	...	18	"
<u>Valves - India Rubber.</u>					
Diameter of Foot Valves	...	...	10 $\frac{1}{4}$	"
"	Bucket	"	...	13	"
"	Bucket Rod	...	2	"	
"	Inlet	...	6	"	
"	Outlet	...	5	"	

No Packing round Air Pump Bucket

WELL PUMPS

Pumps actuated by Compensating Discs
and Rods from Engine Crosshead.

WELL PUMP BUCKETS & SUCTION VALVES

Cast Iron Hat Band Buckets and
Suction Valves or Clacks .

Diameter of Bucket	...	...	14	Ins.
Stroke	do	...	4	Ft. - 6 Ins.
Number of tiers of Hat Bands			4	
1st I.R. Band, Inside dia.			11 $\frac{1}{2}$	Ins.
2nd do	do	...	9 $\frac{3}{4}$	"
3rd do	do	...	8 $\frac{1}{2}$	"
4th do	do	...	6 $\frac{3}{4}$	"
All Hat Band Valves	...	...	$\frac{5}{8}$	" thick.
1st I.R. Band, Depth ..			5 $\frac{1}{2}$	"
2nd & 3rd do	do	...	5	"
4th do	do	...	4 $\frac{1}{2}$	"

SUCTION VALVES OR CLACKS.

All Hat Band Valves for Clacks
are the same as for Buckets.

Diameter of Clack at Seat	...	13½	Ins.
" Well Pump Rods	...	3½	"
" Top do	...	8	"
" Well Pump Guides	...	14½	"
Number of Well Pump Guides in one lift	...	8	

Coupling between Pump Rods -
Parallel.

Length of Coupling	...	15	"
Turned part of rod inside coupling		3¼	" (dia.)

FORCE PUMP.

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

Diameter of F.P. Piston	...	13	Ins.
Stroke	...	5	Feet.
Diameter F.P. Piston Rod, Frone End,		4	Ins.
Gallons discharged per double stroke,		54.74	
Multiplier given to Foreman	...	54	
Excess of discharge of Well Pumps over Force Pumps	...	9.5%	

FORCE PUMP VALVES.

Cast Iron Double Beat with
Gutta Percha Beats.

Number of Suction Valves	...	2	
" Delivery Valves	...	2	
Diameter of Seat of Suction Valves		15½	Ins.
ditto Delivery "		17¼	"
Free lift of Valves	...	½	"

CONDENSER

Open type with tubes expanded into
Tube Plates. Condenser placed in
Force Pump Suction Tank.

Cooling Surface	...	310 Sq. Ft.
No. of Ordinary Tubes	...	132
Length	do ...	6 Ft - 1 $\frac{1}{2}$ Ins
Diameter	do ...	1 $\frac{1}{2}$ In ext.
Thickness	do ...	17 B.W.G.
Stay Rods (Iron)	...	1
Diameter	do ...	1 $\frac{1}{4}$ Ins.
Pitch of Tubes	...	2 "
Diameter of Tube Plates .		2 Ft - 9 $\frac{1}{2}$ Ins
Thickness	do ...	1 In
Distance apart over Tube Plates		6 Ft - 1 In.
Diameter of Exhaust Inlet		11 $\frac{1}{2}$ Ins.
" Outlet	...	6 "

AIR DELIVERY VESSEL. (CAST IRON)

Total height, inside	...	15 Ft - 0 $\frac{1}{2}$ Ins
Diameter	do ...	2 " - 3 "
Height above Branches	...	13 " - 11 "
Thickness of Metal	...	1 $\frac{1}{2}$ In.
Working pressure per sq. inch.		225 Lbs.

DELIVERY AIR VESSEL.

Capacity above Branches ..		55 C. Ft.
Total Capacity	...	60 do

OVERHEAD CRANE

Made by Craven Bros Ltd.,

Manchester.

Load	...	10 Tons.
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STEAM BOILERS (LANCASHIRE) ... 4

Maker of Nos 1, 2 and 3 Boilers,
Tinkers of Manchester.

No. 4. Boiler made by Messrs
E. Danks & Co. Oldbury.

(Maker's no. on Boiler, 112)

BOILERS, 1, 2 and 3.

DIMENSIONS:-

Diameter of Boilers	...	6 Ft - 6 Ins
Length do	...	26 Ft.
Thickness of Shell Plate	...	$\frac{3}{8}$ In.
" End Plates	...	$\frac{1}{2}$ "
Diameter of Internal Flues,		
Front End	...	2 Ft - 6 Ins.
ditto Back End	...	2 " - 1 "
Thickness of Flue Plates	...	
Front End Section		$\frac{3}{8}$ In.
Intermediate		$\frac{3}{8}$ "
Back End Section		$\frac{3}{8}$ "
Size of (Circular) Manhole		16 " "
Steam pressure per square inch		60 Lbs.
Total Heating Surface	...	740 Sq. Ft.
" Grate Area	...	30 " "

MOUNTINGS ON EACH BOILER.

- One Junction Valve.
- One Anti-Priming Pipe.
- One High Steam and Low Water Safety Valve.
- One double Lever Safety Valve.
- One Check Feed Valve ... 2 In. dia.
- Two sets of Water Level Gauges, $\frac{3}{4}$ " "

BOILERS - NO. 2. ENGINE

MOUNTINGS, etc, continued.

One Blow-down Valve.

Two fusible Plugs in each Boiler.

NO. 4. BOILER

Diameter	...	...	8 Feet
Length	...	...	30 "
Thickness of Shell Plate	...	...	$\frac{5}{8}$ In.
"	End	"	...
			$\frac{11}{16}$ "
Thickness of Flue Plates :-			
Front End Section ..			$\frac{1}{2}$ In.
Intermediate	...	...	$\frac{7}{16}$ "
Back End Section ...			$\frac{1}{2}$ "
Size of Manhole (McNeil type)			16 In x 12 In.
Steam pressure per Sq. Inch.			110 Lbs.
Hydraulic Test Pressure	...	...	220 "
Usual Working Pressure at Station,			60 "
Total Heating Surface	...	...	1068 Sq. Ft.
"	Grate Area	...	38 "

MOUNTINGS ON BOILER

All fittings of Hopkinson's make.

Specification - A.1906

One Fig. 1,000 Patent "Triad" Junction Valve	...	7 Inch.
One Cast Iron Anti-Priming Pipe.		
One Patent "Duad" Safety Valve for High Steam and Low Water with Plate Weights complete ..		Figure 7.
One Dead Weight Safety Valve for high steam only	...	Figure 20 3 Inch.

MOUNTINGS ON NO.4. BOILER, continued.

The above safety Valves are for
Working pressure of 70, 80 and
110 lbs per Sq. Inch.

One Patent Parallel Slide Blow-off Valve (all bronze) with locking Gland and Box Key ...	Figure 2540 2½ In.
One Cast Steel Taper Elbow Pipe	Figure 9064.
One Patent Accessible Check, Feed Valve ...	Figure 1320 2½ Ins.
Two Patent "Absolute" Water Gauges with Safety Shields "B".	Figure 6440 ¾ Inch.
Centres of Arms ...	18 "
One drain Pipe joined to Hopkinson's Polished "V" Pipe ...	Figure 6230
One Brass Working Level Pointer,	" 6250
One Open Faced Dial Steam Gauge, own make, ...	" 4000 & " 4180 10 In. dia.
Number of Fusible Plugs in Boiler,	2

2ND ENGINE INSTALLED

known as

NO. 1. ENGINE

Engine Builder's Order No ... 5290

Centre of Rising Mains of Engine ...	4 Ft - 2 Ins
Diameter of Pipes of Rising Main ...	16½ Ins.
Length ditto ...	9 Feet
Thickness of Metal of Pipes ...	¾ In.
Diameter of Flanges ...	23½ In.
Thickness do ...	1½ In.

RISING MAINS

222

Each Risin Main or Lift consists of ten lengths of 9 ft. piping, One Working Barrel, Suction Valve Box, Suction Pipe and Snore, Top Guide Length and Closing Length.

CAST IRON WORKING BARREL

Diameter	...	...	15 $\frac{3}{8}$ In.
Length	...	...	7 Ft. - 6 Ins.
Thickness of Metal	...	...	1 $\frac{3}{8}$ In.

SUCTION VALVE BOX

Diameter, narrow part	...	...	16 Ins.
Length of Valve Box	...	...	4 Ft - 6 Ins.
Thickness of Metal	...	...	1 $\frac{1}{2}$ In.

NOTE:- G.M.Seat in Valve Box for Suction Valve.

CAST IRON SNORE PIECE.

Diameter, narrow part	...	...	15 $\frac{1}{2}$ Ins.
Length	...	...	2 Ft - 9 Ins.
Number of Holes ..	...	...	455
Diameter of Holes .	...	...	1 In.

SUCTION LENGTH OF PIPE

Diameter	...	...	13 Ins.
Pipe of the Sliding Windbore Type.			
Length. (Minimum, when closed)			
do	(Maximum when fully extended)		

ENGINES

Compound Horizontal Tandem

Differential Surface - Condensing.

CAPACITY OF ENGINE.

223

Specified Net Quantity per 24 hours, at
140 ft. per minute, 1,500,000 gallons.

SPECIFIED HEAD

Specified depth of Well	...	150 Feet
Head on Delivery Main (including friction)		510 "
<u>TOTAL SPECIFIED HEAD</u>		<u>660 "</u>

Pump Horse Power at 140 ft. per min.		208
Double Strokes per min.	...	14
Diameter of H.P. Cylinder	...	34 In.
do L.P. do	...	64 In.
Stroke of Engine	...	5 Feet
<u>Cylinders - Steam Jacketted.</u>		

PISTON RINGS.

Made by Lancaster & Tonge, Manchester.

PISTON ROD PACKINGS

Maker - Lancaster & Tonge, Manchester.

PISTON RODS

Diameter - Front End H.P.	...	4½ Ins.
do Centre	...	6 "
do Back End L.P.	....	4½ "

ENGINE VALVE GEAR.

Valves to be actuated in accordance with
Davey's Patents. Valve Gear to be
steam driven. Slide Valves fitted
with Meyer cut off. Adjustable by hand.

DIFFERENTIAL GEAR.

Diameter of Steam Cylinder	...	11 Ins.
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DIFFERENTIAL GEAR. continued.

Stroke	12	Ins.
Diameter of Water Cylinder	9	"
"	Pausing	"	4	"
"	Steam	" (Piston Rod.)	2	"
"	Water	" do	2	"

AIR PUMP

Two Single-Acting Vertical
Actuated by Lever from
Compensating Discs.

Diameter	...	...	18	Ins.
Stroke	...	...	24	"

Valves of India Rubber.

Diameter of Foot Valves	...	...	12 $\frac{1}{2}$	"
"	Bucket	...	15 $\frac{1}{2}$	"
"	do Rod (Muntz Metal)	...	2 $\frac{1}{2}$	"
"	Inlet	...	8	"
"	Outlet	...	8	"
Packing round Bucket	...	...	$\frac{1}{2}$	" (Rope)

WELL PUMPS

Pumps actuated by Compensating
Discs and Rods from Engine Crosshead.

WELL PUMP BUCKETS & SUCTION VALVES.

Cast Iron Hat-Band Buckets and
Suction Valves or Clacks.

Diameter of W.P. Bucket	...	...	15 $\frac{3}{4}$	Ins
Stroke	do	...	5	Ft - 3 Ins.
Number of Tiers of Hat Bands	...	...	4	
1st I.R. Band, (inside dia:)	...	...	12 $\frac{1}{2}$	Ins.
2nd do do do	...	...	11	"

WELL PUMP BUCKETS & SUCTION VALVES continued

3rd I.R. Band (inside dia.)	...	9 $\frac{1}{2}$	Ins
4th do do	...	8	"
1st I.R. Band depth	...	6 $\frac{1}{2}$	"
2nd and 3rd " "	...	5	"
4th " "	...	4 $\frac{1}{2}$	"
All Hat Band Valves	...	$\frac{8}{8}$	" thick

SUCTION VALVE OR CLACKS

All India Rubber Hat Bands for
Clacks the same as for Buckets.

Diameter of Well Pump Rods	...	3 $\frac{5}{8}$	Ins.
" Top ditto	...	3 $\frac{5}{8}$	"
No. of Well Pump Guides in one lift,	5		
Diameter ditto		15 $\frac{7}{8}$	"
Length of Coupling (Parallel) between Pump Rods,	...	15	"
Turned part of rod inside Coupling,		3 $\frac{9}{16}$	" dia.

FORCE PUMP.

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

Diameter of Piston	...	15 $\frac{1}{2}$	Ins
Stroke	...	5	Feet
Diameter of Piston Rod (Front end only)		4 $\frac{1}{2}$	Ins
Gallons discharged per double stroke ..		78.24	
Multiplier given to Foreman	...	78	
Excess of discharge of Well Pumps over Force Pump	...	7.9%	

FORCE PUMP VALVES.

Cast Iron Double Beat with
Gutta Percha Beats

Number of Suction Valves	...	2
" Delivery do	...	2
Diameter Seat of Suction Valves ..		18½ Ins
" " Delivery "	..	21½ "
Free lift of Valves	...	-

CONDENSER.

Open type with tubes expanded
into tube plates. Condenser
placed in Force Pump Suction
Tank.

Cooling Surface	...	620 Sq. Ft.
Number of Ordinary Tubes	...	349
Length do	...	7 Ft - 1½ In
Diameter do	...	1 In Ex.
Thickness do	...	19 B.W.G.
Number of Stay Rods	...	-
Pitch of Tubes	...	1½ Ins
Diameter of Tube Plates	...	3 Ft - 3½ Ins
Thickness do	...	1½ Ins.
Distance apart over Tube Plates ..		7 Ft - 1 Ins
Diameter of Exhaust Inlet	...	11½ Ins
" Outlet	...	8 "

AIR DELIVERY VESSEL

Total height inside	...	15 Feet
Diameter inside	...	2 Ft - 7½ Ins
Height above Branches ..	...	13 " - 9½ "
Thickness of Metal	...	2½ Ins.

AIR DELIVERY VESSEL continued

Working pressure	...	...	225	Lbs.
Test Pressure	...	...	670	"
Capacity above Branches	..	...	75	C.Ft.
Total Capacity	...	...	81	"

MAIN BRAKE ON SAFETY TRIP GEAR

Diameter of Cast Iron Weight	...	...	12	Ins
" Safety Trip Valve	...	...	2 $\frac{1}{2}$	"
" Vacuum Spoiler Pipe	...	...	2	"
" Trip Cylinder	...	...	1 $\frac{1}{2}$	"

FEED WATER FILTER.

Made by Harris Patent Feed Water Filter Ltd.,

Newcastle-on-Tyne. Maker's No., 1105.

FEED PUMPS. 1

Double Ram. Made by J. Evans & Sons,

Wolverhampton.

Number on Pump - 12195.

Diameter of Rams	...	...	3 $\frac{1}{2}$	Ins
Stroke of Pump	...	...	5	"
Diameter of Steam Cylinder	..	...	6	"
" Steam Pipe	...	...	1 $\frac{1}{2}$	"
" Exhaust Pipe	..	...	1	"
" Suction & Delivery Pipes	..	...	2 $\frac{1}{2}$	"

One $\frac{1}{3}$ pint "Victor" Sight Feed

Made by C. Winn & Co., B'ham.

Maker's No. 3637.

On DIFFERENTIAL GEAR

As above - Maker's No. 3280.

ON MAIN ENGINE FOR CYLINDERS

Sight Feed Lubricator by C. Winn & Co.

Maker's No - 867

NO. 2. ENGINE

ON DIFFERENTIAL GEAR.

One $\frac{1}{3}$ Pint "Victor" Sight Feed

Made by C. Winn & Co., Birmingham.

Maker's No., 3481.

ON MAIN ENGINE FOR CYLINDERS

Sight Feed Lubricator, made by

C. Winn & Co., Birmingham.

Maker's No. - $\frac{232}{714}$ A

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