S. S. W. W.

DESCRIPTION OF PUMPING STATIONS

1921.

VOL. I

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ENGINEER.

SOUTH STAFFORDSHIRE WATERWORKS COMPANY.

PUMPING STATIONS.

Index.

ASHWOOD PUMPING STATION

situate at

KINGSWINFORD, Nr. DUDLEY

SUMMARY

No. 1. Engine.	Total Specified Head,	680	Feet.
No. 2. "	ditto	738	"
No. 3. "	ditto	738	"

Total Engine Power at Station is equivalent to 5½ million gallons per 24 hours.

No. 1. Engine	Power per day ...	1,000,000	Gallons
No. 2. "	ditto ...	2,250,000	"
No. 3. "	ditto ...	2,250,000	"

COSTS

	£.	s.	d.
Land and Law Charges ...	2,297.	14.	10.
Six Boreholes ...	6,000.	17.	1.
Buildings	15,374.	8.	1
Cottages	1,545.	15.	10.
3 Engines and 8 Boilers ...	26,423.	6.	4.
Boundary Wall, Fencing, etc. .	1,452.	8.	8.
VENTURI RECORDERS	1.029.	0.	0.
TOTAL COST	£ 54,123.	10.	10.

PUMPING STATION COMMENCED ... 1892

ditto COMPLETED ... 1906.

ASHWOOD P.S. # 2

L A N D

1st piece purchased	...	July 26th, 1892.
Area	...	1 Acre
2nd piece purchased	...	May 20th, 1894.
Area	...	2 Roods, 32 Poles.

The above land was purchased from the Earl of Dudley.

3rd piece purchased	...	March, 1921.
Area	...	4.748 Acres.

- - - - - - - - - -

Level of E.H.F. above O.D. 212 Feet

- - - - - - - -

CONTRACTORS:-

BOREHOLES

Nos 1 and 2.	F. Coulson,	1891 - 1892.
Nos 3 " 4.	E. Chapman & Sons.	1899 - 1900.
Nos 5 " 6.	Mather & Platt) Ltd.	1904 - 1905.

BUILDINGS

1st Engine & Boiler House)	Lowe & Sons.	1891 - 1893.
2nd do.	Whittaker & Co.Ltd.	1899 - 1900.
3rd do.	Dallow J. & Sons.	1904 - 1906.
5 Cottages,	Lowe & Sons,	1894 - 1895.

ENGINES.

No. 1. Engine, Hathorn Davey & Co.

3 Boilers. Spurr, Inman & Co. Ltd.

No. 2. Engine, do

2 Boilers, E. Danks & Co.

ASHWOOD P.S.

No.3. Engine ... Hathorn Davey & Co. Ltd.

3 Boilers ... H & T Danks Ltd.

- - - - - - -

C O S T S

LAND.

	£. s. d.	£. s. d.
1st piece ...	1500. 0. 0.	
2nd piece ...	600. 0. 0.	
		2,100. 0. 0.
Law Charges ...	- - -	197. 14. 10.

BOREHOLES NOS 1 & 2.

Sinking Shaft and Boring	1001. 16. 4.	
Test Pumping and Bore - hole Castings	599. 14. 5.	
Lining Boreholes with M.S. Tubes	182. 12. 5.	
Printing Specification.	5. 18. 0.	1,790. 1. 2.

BOREHOLES NOS 3 & 4.

Sinking Shaft and Boring,	1828. 8. 1.	
Borehole Castings,	360. 0. 0.	
Printing Specification,	5. 17. 9	2,194. 5. 10.

BOREHOLES NOS 5 & 6.

Sinking Shaft & Boring,	1377. 19. 0.	
Borehole Castings,	449. 18. 5.	
do do	188. 12. 8.	2,016. 10. 1.

Total cost of 6 Boreholes

£6,000. 17. 1.

BUILDINGS.

Nos 1, 2 and 3 Engines and Boiler Houses,	15,374. 8. 1.
5 Cottages	1,545. 15. 10.

ENGINES AND BOILERS

No.1. Engine and 3 Boilers ...	6,047. 2. 3.
No.2 " " 2 " ...	9,755. 4. 1.
No.3. " " 3 " ...	10,621. 0. 0.
BOUNDARY WALL & FENCING, ETC., ...	1,452. 8. 8.
VENTURI RECORDERS	1,029. 0. 0.
TOTAL COST -	£ 54,123. 10. 10.

PARTICULARS OF NO. 1. ENGINE

Builder's Order No.	... ...	4921.
ENGINE HOUSE.		
Internal dimensions	.. ...	49 Feet. Long .
ditto	... ...	19 " Wide
Height to top of Wall Plate	...	24 Ft - 9 Ins.
Depth of Foundations	...	14 Ft - 6 Ins.
BOILER HOUSE.		
Internal dimensions	... ...	92 Ft-9 Ins Long.
ditto	... ...	28 " 7½ " Wide.

NOTE:- Boiler House common to No. 2. Engine

BOREHOLES NOS 1 & 2.

Distance apart	... ...	20 Feet.
NO. 1. Borehole	24 In. dia to a depth of	285 Ft - 8½ Ins from E.H.F.
	Lined with steel tubes ...	20 Ins dia.
NO. 2. do	24 In. dia to a depth of	286 Ft - 8½ Ins from E.H.F.
	Lined with steel tubes ...	20 Ins dia.
Top of Boreholes from E.H.F.	...	8 Ft - 8 Ins.
Cast Iron Stool for suspending Rising Mains concreted round Boreholes.	Depth	10 Ins.
do	Base	4 Ft. Sq.
do	Thickness of Base	3 Ins.

RISING MAIN OF BOREHOLES

Diameter of Mild Steel Tubing (inside)	14 Ins.
Length of each Tube ...	15 Ft. 0½ Ins.
Thickness do ...	½ In.
Diameter of Couplings (outside)	16 Ins.
Length ditto	8 "

ASHWOOD P.S. (NO. 1. ENGINE.)

RISING MAIN OF BOREHOLES continued.

Each Rising Main consists of 18 Tubes and 18 Couplings.

Tubes and Couplings screwed,	8 Threads per in
Two Suction Tubes to each Rising Main,	12 In. dia.
Length of each Tube ...	10 Feet
One coupling	8 In. long.

CAST IRON WORKING BARRELS OF BOREHOLES

Diameter	13 Ins.
Length	10 Feet
Flange on bottom end ...	18¼ Ins.
Screwed other end of barrel to receive one-half of M.S. Coupling for a length of	6 Ins.
No. of threads per inch ...	8
Thickness of Metal ...	1¼ Ins.

Working barrel and Suction Valve Box are one Casting.

STRAINERS.

In place of Strainers 20 Ft. of Mild Steel Tubing secured to bottom flange of Working Barrel or Suction Valve Casting.

ENGINE.

Compound Horizontal Tandem Differential Surface-Condensing type.

CAPACITY

Net quantity per 24 hours @ 140 ft. p.m. 1,000,000 gals

SPECIFIED HEAD

Maximum lift in Boreholes ...	300 Feet.
Ordinary Working Lift ...	-

SPECIFIED HEAD, continued.

Ordinary Working Lift ...	300	Feet
Head on Delivery Main (Including Friction)	380	"
TOTAL SPECIFIED HEAD	680	"

Pump Horse Power at 14 double strokes,	143	
Speed per minute double strokes,	14	
Diameter of Steam Cylinders, H.P.	30	Inches.
ditto L.P.	52	"
Stroke of Engine	5	Feet
Cylinders, Steam jacketted.		
Piston Rings	Buckley's No.2. Restrained.	
Diameter of Piston Rods, H.P. Front end,	4½	Inches.
ditto Centre,	5½	"
ditto L.P. Back End,	4	"
Piston Rod Packing	U.S.Metallic.	

ENGINE VALVE GEAR.

Valves to be actuated in accordance with Davey's Patents.

Valve-Gear to be steam-driven.

Diameter of Slide Valve Spindles ...	1¾	Inches.
" " Expansion " ...	1½	"

AIR PUMPS

Two Vertical Single Acting actuated by lever from Compensating Lever Shaft over Borehole.

Diameter of Air Pump ...	17	Inches.
Stroke	18	"
Valves	India Rubber.	
Diameter of Foot Valve ...	13 Ins x 1 In Thick.	

ASHWOOD P.S. (NO. 1. ENGINE)

AIR PUMPS continued

Diameter of Bucket Valve	...	15 Ins. x 1 In. thick.
" " Inlet	...	6 Ins.
" " Outlet	...	4 "
Type of Packing round bucket	...	Brass Ring.

BOREHOLE PUMPS.

Pumps actuated by Compensating Levers and Rods from Crosshead of Piston Rod.

BOREHOLE BUCKET AND SUCTION VALVE.

Cast Iron double beat with G. P. Beats.

Diameter of Borehole Buckets ...	13 Inches.
Stroke do ...	5 Feet.
Diameter of Borehole Suction Valve,	12½ Inches.
" " " Pump Rods ..	3½ "
" " Top Rod to Pump Crosshead)	3½ "
Number of Borehole Guides in one lift)	18 "
Diameter of Guides ...	13½ "
Type of Coupling between pump rods,	Parallel.
Length of Coupling ...	13 Inches
Turned part of coupling (inside)	3¼ "

FORCE PUMP

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

Diameter of F.P.Piston ...	13 Inches.
Stroke of do. ...	5 Feet.
Diameter of F.P.Piston Rod , Front end only ...	4 Inches.
Gallons discharged per double stroke	54.8

ASHWOOD P.S. (NO. 1. ENGINE).

FORCE PUMP continued.

Multiplier given to Foreman	...	54.
Excess of discharge of Borehole Pumps over Force Pumps	...	4.96%

FORCE PUMP VALVES.

Cast Iron Double Beat, with G. P. Beats.

Number of Suction Valves	...	2
" " Delivery do	...	2
Free lift of Valves	...	¾ In.

CONDENSER.

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

Cooling Surface ...	...	383 Sq. Ft.
Number of Ordinary Tubes	...	166
Length do	...	6 Ft - 1½ Ins.
Diameter do (external)	...	1½ Ins.
Thickness do	...	17 B.W.G.
No. of Stay Rods	...	1.
Pitch of Tubes ...	...	2 Ins.
Diameter of Tube Plates	...	3 Ft - 3¼ Ins.
Thickness do	...	1¼ In.
Diameter of Stay Rod (Iron)	...	1¼ Ins.
Distance apart over plates	...	6 Ft. - 1 In.
Diameter of Exhaust Inlet	...	11½ Ins.
" " Outlet	...	6 Ins.

ASHWOOD P.S. (ENGINE NO. 1.)

AIR VESSEL. (CAST IRON)

Total height inside	...	15 Ft - 10 Ins
Diameter "	...	2 Ft.
Height above Branches	...	14 Ft.
Thickness of Metal	...	2½ Ins.
Working pressure	...	190 Lbs.
Capacity above Branches	...	43 C. Ft.
Total Capacity	...	

OVERHEAD TRAVELLING CRANE.

Made by:- J. Spencer & Co., Manchester.

Load to lift	...	10 Tons.

WINCH FOR BOREHOLES

Hand Type. Made by,
J. Spencer & Co., Manchester.

AIR CHARGER ON AIR VESSEL.

Wipperman & Lewis. Made by -
Hathorn, Davey & Co., Leeds.

BOILERS. (LANCASHIRE - STEAM)

Made by:- Spurr, Inman & Co. Ltd.,

Number	... ...	3
Numbered	... ...	1, 2 & 3.
Diameter	... ...	6 Ft. 6 Ins.
Length	... ...	26 Ft.
Thickness of Shell Plate	...	⅜ In.
" " End Plates	...	½ In.
Diameter of Internal Flues, Front end,		2 Ft - 6 Ins.
ditto Back end,		2 Ft.
Thickness of Flues, Front End Section,		⅜ In.
ditto Intermediate "		⅜ "
ditto Back End "		⅜ "

BOILERS continued.

Manhole	Circular.
Size	16½ Ins.
Steam pressure per square inch	60 lbs.
Total heating surface ...	740 Sq. Feet.
Total Grate area	30 " "

MOUNTINGS ON BOILERS.

6 Inch Junction Stop Valve, diameter,	6 Ins. dia.
Compound Safety Valve ...	5 " "
Balanced Lever Safety Valve ...	4 " "
Hopkinson's Feed Check Valve ..	2 " dia.
One Blow-off on bottom of Boiler,	2½ " "
Fusible Plugs on each Boiler ..	2

BOILER FEED PUMPS.

No. of Pumps 2

(One pump as spare in reserve)

Horizontal Duplex Pump - made by Tangye's, Birmingham.

FEED WATER FILTER

Made by The Harris Patent Feed Water Filter Co., Newcastle-upon-Tyne.

Maker's number on Filter - 1372.

CAST IRON FEED TANK.

Approximate size of Tank

NO. 2. ENGINE

Engine Builder's Order Number ... 5618

ENGINE HOUSE.

Internal dimensions,	length	60 Feet.
ditto	width	18 "
Height to top of wall plate.		26 Ft - 3 Ins.
Depth of Foundations ...	...	15 " - 3 "

BOILER HOUSE.

For description see No. 1.

Engine - Page No. 3.

BOREHOLES.

Numbers	3 and 4.
Distance apart	20 Feet.
No.3. - 33 In. dia. to depth of ...	299 " from E.H.
No.4. - 33 " " do ...	299 " " do
No.3. - 18 " " do ...	508.3" " do
No.4. - 18 " " do ...	342. " " do
Top of Boreholes from E.H.F., ...	10 Ft - 4 Ins.
Cast Iron lining tubes for suspending Rising Mains concreted round Boreholes to a depth of ...	40 Ft - 6 Ins do
Inside diameter of Castings ...	3 Ft.
Thickness of Metal	1½ Ins.

RISING MAIN OF BOREHOLES.

Diameter of M.S.Rubing inside, top half,	19½ Ins.
Length of each tube	15 Feet.
Thickness do (top half) ...	⅝ In.
Dia. of M.S.Tubing inside, bottom half,	19¾ "
Length of each tube	15 Ft.
Thickness do	½ In.
Diameter of Couplings	22 "
Length of do	12 "

RISING MAIN continued

Each R.M. consists of 9 pipes, 19½ In. internal dia. ⅝ In. thick for top portion and 9 pipes 19¾ In. dia. ½ In. thick for lower portion.

Tubes and Couplings screwed per in.	8 Threads
1 Suction Tube to each main ...	16½ Ins. dia.
ditto Length ...	15 Feet
ditto Thickness	⅝ Ins.
Joints between Tubes made of G.P. Cord ... diameter ..	7/16 "

CAST IRON WORKING BARRELS IN BOREHOLES.

Diameter	18¾ Ins.
Length	9 Ft - 6 Ins.
Thickness	1½ Ins.
Flange on bottom end ...	2 Ft - 3 Ins dia.
Thickness of Flange ...	3 Ins.
Screwed externally on top end of barrel to receive one-half of coupling for Rising Main. Depth screwed ...	8 Ins.

CAST IRON SUCTION VALVE BOX.

Diameter , Narrow part ...	19½ Ins.
Length of Suction Valve Box ...	5 Ft - 6 Ins.
Thickness of Metal ...	1½ In.
Flange, on top	2 Ft.-3 Ins. dia.
Thickness of Flange ...	3 Ins.
Screwed internally on bottom end to receive Suction Tube. Depth screwed	8 Ins.
C.I. Stool at bottom of Rising Main. Diameter (approximate) ...	2 Ft. 9 Ins.
Length do ...	5 Ft. 9 Ins.

Suction Valve Box fitted with G.M. seat for Suction Valve.

ASHWOOD P.S. (NO. 2 ENGINE) 13

ENGINE.

Compound Horizontal Tandem

Differential Surface -

Condensing.

CAPACITY OF ENGINE.

Net quantity per 24 hours @ 140 feet per minute ...	2,250,000 gallons.

SPECIFIED HEAD.

Maximum lift in Boreholes .	300 Feet.
Ordinary working lift ...	300 "
Head on Delivery Main (including friction.)	438 "
TOTAL SPECIFIED HEAD .	738 "

Pump Horse Power at 11.66 double strokes)	349·43.
Speed per minute, double strokes,	11.66
Diameter of Steam Cylinders, H.P.,	48 Ins.
ditto L.P.,	80 "
Stroke of Engine ...	6 Feet.

Cylinders Steam Jacketted.

Piston Rings - Lancaster & Tongue's.

Diameter of Piston Rods.	H.P.Front End	5 Ins.
ditto	Centre,	7 "
ditto	L.P., Back end	5 "

PISTON ROD PACKINGS

Patent Metallic Packings of

Messrs Lancaster & Tonge's make.

ENGINE VALVE GEAR.

The valves to be actuated in

accordance with Davey's Patents.

Valve Gear to be steam driven.

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

Diameter of Slide Valve Spindles, Front End,	$2\frac{1}{2}$	Ins.
ditto Expansion do do	2	Ins.
ditto Slide Valve Spindles. Centre,	2	Ins.
ditto Expansion do "	$1\frac{3}{4}$	Ins.
ditto ditto Back End,	$1\frac{1}{2}$	Ins.

DIFFERENTIAL GEAR.

Diameter of Steam Cylinder ...	15	Ins.
Stroke do ...	12	"
Diameter of Water Cylinder ...	12	"
Stroke do ...	12	"
Diameter of Steam & Water Piston Rods,	$2\frac{1}{2}$	"
" " Pausing Cylinder ...	3	"

AIR PUMPS.

Two Vertical Single-Acting, actuated by lever from compensating lever shaft over Borehole.

Diameter	25	Inches.
Stroke	2	Feet.
Valves	India-Rubber	
Diameter of Foot Valves	15	Inches.
" Bucket "	21	"
" Inlet	9	"
" Outlet	6	"
" Muntz. Metal Bucket Rod ..	$2\frac{3}{4}$	"
Packing round Air-pump Bucket ...	$\frac{3}{4}$	In. Hemp

BOREHOLE PUMPS.

Pumps actuated by Compensating levers and rods from Crosshead of Piston Rod.

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

BOREHOLE BUCKET AND SUCTION VALVE.

Cast Iron Double Beat with G.P.Beats.

Diameter of Borehole Buckets ...	18¾	Ins.
Stroke do ...	6	Feet.
Diameter of Borehole Suction Valve ...	18½	Ins.
" Pump Rods. ...	5	"
" Top Pump Rod ...	5	"
" Guides	18¾	"
No. of Borehole Guides in one Lift ...	13	
Type of coupling between Pump Rods,...	Parallel.	
Length of Coupling	19½	Ins.
Turned part of Pump Rod inside Coupling, .	4½	"

FORCE PUMP

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

Diameter of F.P.Piston	18¾	Ins.
Stroke do	6	Feet.
Diameter of F.P.Piston Rod .(Front End only.)	5	Ins.
Gallons discharged per double stroke .	138.69	
Multiplier given to Foreman ...	138	
Excess of discharge of Borehole Pumps over Force Pumps ...	3.69%	

FORCE PUMP VALVES.

Cast Iron Double Beat with G.P. Beats.

Number of Suction Valves ...	2	
" " Delivery " ...	2	
Dia. of Seat of Suction Valves ..	2	Feet.
do do Delivery " ...	2 Ft - 2½	Ins

F.P.VALVES continued.

Free lift of Valves .. 1 Inch.

CONDENSER.

Open type with Tubes expanded into Tube Plates; Condenser placed in F.P. Suction Tank.

Cooling Surface	1205 Sq. Ft.
No. of ordinary Tubes ..	577
Length do ...	8 Ft - 3 Ins.
Diameter do (external) ...	1 In.
Thickness do ...	19 B.W.G.
No. of Stay Tubes on Rods ...	0
Pitch of Tubes	1½ In.
Diameter of Tube Plates ...	3 Ft - 11¼ Ins.
Thickness do ...	1¼ Ins.
Distance apart (over Tube Plates)	8 Ft - 2½ Ins
Diameter of Exhaust Inlet ...	17 Ins.
" Outlet ...	9 "

AIR VESSEL. (CAST IRON)

Total height inside ...	21 Ft - 4 Ins.
Diameter " ...	3 Ft.
Height above branches ...	19 Ft. 9 Ins.
Thickness of Metal ...	2½ Ins.
Working pressure ...	190 Lbs.
Capacity above Branches ...	140 C. Ft.
Total Capacity	150 "

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

OVERHEAD TRAVELLING CRANE.

Made by - J.Spencer & Co.,
Hollinwood, Manchester.

Load	15 Tons.
Span	18 Ft. - 2 Ins.
Top of Crane Rail from E.H.F. ...	16 Ft. - 2 "
Type	Hand Crane.

WINCH. ... ... 1.

Horizontal Steam.

Diameter of Cylinders	8 Ins.
Stroke "	12 "
Barrels -	Not grooved.
Diameter of wire rope	$1\frac{1}{16}$ In.
" Barrel	18 "
Length do	$23\frac{3}{4}$ "
Diameter of Steam Inlet	2 "
" Exhaust Outlet ...	$2\frac{1}{2}$ "
" Warping Drum	14 "
Load to lift double purchase ...	5 Tons.

AIR COMPRESSOR.

Made by Westinghouse Brake Co.,
London. - Westinghouse Type.

Size	8" / $3\frac{1}{2}$"
Class	F.
Steam Inlet	1 In. dia.
Exhaust Outlet	$1\frac{1}{4}$ " "
Air Delivery	1 " "
Stroke of Compressor	8 Ins.
Diameter of Steam Cylinders ...	8 "
" Air do ...	$3\frac{1}{2}$ "

Maker's No. 33150. Works No. 11269

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

OIL SEPARATOR ON EDUCATION PIPE.

Made by:- The Baker Oil Separator Co.,
Leeds.

Horizontal and Cylindrical.

Diameter of Separator	...	4 Feet.
Length do	...	6 "
Capacity of do	...	7500 lbs of Steam. per hour.
Diameter of Inlet and Outlet .		17 Ins.

OIL PUMP FOR SEPARATOR.

Made by:- The Baker Oil Separator Co.,
Leeds.

Diameter of Plunger	...	3¼ Ins.
Stroke do	...	3¼ "

OIL TANK FOR SEPARATOR

2Ft - 9 Ins x 1 Ft. - 9 Ins x 2 Ft - 6 Ins.

STEAM RECEIVER (Between H.P. and L.P. Cylinders).

Approximate Dimensions.

Diameter over Flanges	...	3 Ft - 4 Ins.
Length "	...	11 Ft.
Diameter of Inlet and Outlet ..		13 Ins.
" Reheater Coils in Receiver,		1½ " Copper.

STEAM SEPARATOR on STEAM MAIN
(In Boiler House between Nos
1 and 2 Engines.)

Internal Diameter	...	18 Ins.
Length of Separator	...	7 Ft - 6 Ins.

STEAM TRAP (to drain Steam Separator).

Size ...	...	1 Inch

STEAM BOILERS - 1899. (Made by Danks & Co., Oldbury.)

2 Boilers of Lancashire type.

Numbers	... ...	4 and 5
Diameter of Boilers	...	8 Feet.
Length do	...	30 "
Thickness of Shell Plate	...	½ In.
" End do	...	9/16 "
Dia. Internal Flues, (Front End)		3 Ft - 2 Ins.
ditto (Back ")		2 " - 10 "

Thickness of Flue Plates -

Front End Section	...	9/16 In.
Intermediate "	...	7/16 "
Back End "	...	9/16 "

16 Inch Circular Manhole

Steam Pressure per Sq. inch	..	80 Lbs.
Total heating surface	...	1068 Sq. Ft.

MOUNTINGS ON BOILERS.

All fittings to be of Hopkinson's make.

One Junction Valve	...	8 In. dia.
One Anti-Priming Pipe.		
One Compound Safety Valve, with plate weights complete.		
One Dead Weight Safety Valve.		3 In. dia.
One Check Feed Valve	...	2½ " "
One Blow-off Valve on each boiler of the Parallel Slide Type		2½ " "
Two Water Gauge Fittings to each Boiler.		
Valves on Steam Range in Boiler House		2
Size of Feet Valves	...	8 Ins.
Diameter of Steam Pipes	...	8 "

FITTINGS AND TACKLE

One 8 In. Standard Stop Valve 22 Inch over Flange	...	8 - In. dia.
Diameter of Flanges	...	14½ "
One set of fishing tackle for drawing Borehole Suction Valve.		

RELIEF VALVE FOR DELIVERY PIPES.

Diameter of Relief Valve Opening		6 Ins.
M.S.Bogies on Lattice Girder for withdrawing Borehole Pumps		2
Two 4 Sheave 40 ton blocks for wire rope	...	1 In. dia.
" 3 ditto	ditto	1 " "

NO. 3. ENGINE

Engine Builder's Order No.	...	6082

DESCRIPTION OF ENGINE HOUSE .

Internal Dimensions, length	...	60 Feet.
do width	...	21 "
Height to top of Wall Plate	...	26 " 9 Ins
Depth of Foundations	...	15 " 3 "

BOILER HOUSE.

Internal Dimensions, Length	...	59 Ft - 6 Ins.
do Width	...	36 Ft - 6 "

BOREHOLES.

Numbers	... ...	5 and 6.
No.5., 30 In. dia. to depth of		309 Ft-9Ins from E.H.F
No.6., 30 In. " do		309 " - 9 " do
No.5., 18 In. " do		459 " - 9 " do
No.6., 18 In. " do		621 " - 3 " do
No.5., 15 In. " do		612 " - 9 " do

ASHWOOD P.S. (NO.3.ENGINE.)

Top of Boreholes from E.H.F.,	10 Ft - 4
Cast Iron Lining Tubes for suspending Rising Mains concreted round Boreholes to a depth of ...	39 Ft - 9 Ins from E.H.F.
Inside diameter of Castings	3 Feet.
Thickness of Metal ...	1½ Inch.

RISING MAIN OF BOREHOLES.

Diameter of Mild Steel Tubing "inside" top half ...	19¾ Inches.
Length of each Tube ...	15 Feet.
Thickness do (top half)	⅝ Inch
Diameter of M.S.Tubing "inside" bottom half ...	19¾ "
Length of each tube ...	15 Feet
Thickness do bottom half	½ Inch
Diameter of Couplings :-	
Top half ...	22¼ Ins
Bottom " ...	22 "
Length of Couplings ...	10 "

Each Rising Main consists of 9 pipes, 19¾ Ins. internal dia. ⅝ In. thick for top portion, and 9 Pipes 19¾ Ins. internal dia. ½ In. thick for lower portion.

Tubes and Couplings screwed per inch, 8 Threads.

One Suction Tube to each main.

Length of M.S.Tube ...	15 Feet
Internal dia. ...	16½ Ins.
Thickness of Tube ...	⅝ "

Joints between tubes made of G.P. Cord.

C.I.WORKING BARRELS IN BOREHOLES.

Diameter	18¾ Ins.
Length	10 Ft. - 2 Ins

ASHWOOD P.S. (NO.3.ENGINE)

C.I.WORKING BARRELS IN BOREHOLES continued

Thickness	1½ Ins.
Flange on bottom end ...	2 Ft - 3 Ins dia.
Thickness of Flange ...	3 Ins.
Barrel screwed internally to receive M.S.Tube of Rising Main. Depth screwed	8 Ins.

C.I.SUCTION VALVE BOX.

Diameter, narrow part, ...	19½ Ins.
Length Suction Valve Box ...	5 Ft - 6 Ins.
Thickness of Metal ...	1½ Ins.
Flange on top end ...	2 Ft. - 3 Ins. dia
Thickness of Flange ...	3 Ins.
Box screwed internally on bottom end to receive suction tube. Screwed	8 Ins.

C.I.STOOL AT BOTTOM OF RISING MAIN.

Diameter	2 Ft. - 6 Ins.
Length	4 " - 3 "

Suction Valve Box fitted with

G.M. Seat for Suction Valve.

ENGINE.

Compound Horizontal Tandem

Differential Surface-Condensing.

CAPACITY OF ENGINE.

Net Quantity per 24 hours at 140 ft per minute	2,250,000 gallons.

SPECIFIED HEAD.

Maximum lift in Boreholes ...	300 Feet.
Ordinary working lift ...	250 "
Head on Delivery Main (including friction)	438 "
TOTAL SPECIFIED HEAD	738 "

SPECIFIED HEAD continued

Pump Horse Power ...		349·43
Speed per minute ...		11.66
Diameter of Steam Cylinders	H.P.	40 Ins.
ditto	L.P.	80 "
Stroke of Engine ...		6 Feet.

Cylinders, steam jacketted.

PISTON RINGS.

Lancaster & Tonge
Pendleton, Manchester.

Diameter of Piston Rods.:-

H.P. Front End ...		5 Ins.
Centre ...		7 "
L.P. Back End ...		5 "

PISTON ROD PACKINGS.

Patent Metallic Packings made
by Lancaster & Tonge.

ENGINE VALVE GEAR.

Valves to be actuated in accordance with Davey's Patents. Gear to be water driven.

Diameter of Slide Valve Spindles,	Front End	$2\frac{1}{2}$ Ins.
" Expansion	do do	2 "
" S.V.Spindles	Centre	2 "
" Expansion "	do	$1\frac{3}{4}$ "
" " "	Back End	$1\frac{1}{2}$ "
Travel of Main Slide Valve		8 "
" Expansion "		6 "

DIFFERENTIAL GEAR

Operated by water pressure on Main only. No steam.

Diameter of Water Cylinders	...	10½	Ins.
Stroke do	...	10	"
Diameter of Piston Rod	...	2½	"
" " Pausing Cylinder	...	4	"

AIR PUMPS.

Two Vertical Single Acting actuated by lever from Compensating Lever.

Shaft over Borehole.

Diameter of Air Pump	...	25	Ins.
Stroke do	...	2	Feet.

Valves of India-Rubber.

Diameter of Foot Valves	...	15	Ins.
" Bucket "	...	21	"
" Inlet "	...	9	"
" Outlet "	...	6	"
" Muntz Metal Bucket Rod		2¾	"
Packing round Airpump Bucket	...	⅝	" Hemp.

BOREHOLE PUMPS.

Pumps actuated by Compensating Levers and Rods from Crosshead of Piston Rod.

BOREHOLE BUCKET & SUCTION VALVE

Cast Iron double Beat with G.P.Beats.

Diameter of Borehole Buckets	...	18¾	Ins.
Stroke ditto	...	6	Feet
Diameter Borehole Suction Valve		18½	Ins.
" Pump Rods	...	4½	"

BOREHOLE BUCKET & SUCTION VALVE continued.

Diameter of Top Pump Rod	...	5 Inches.
No. of Borehole Guides in one Lift,		17 "
Diameter of Guides	...	18⅝ Ins.

Coupling between Pump Rods

Tapered.

FORCE PUMP.

Double-Acting Piston Pump driven by

L.P.Piston Tail Rod.

Diameter of F.P.Piston	...	19¼ Ins.
Stroke do	...	6 Feet
Diameter do Rod (Front end only)		5 Ins
Gallons discharged per double stroke		140.4
Multiplier given to Foreman	...	140
Excess of discharge of Borehole Pumps over Force Pump	...	2.09%

FORCE PUMP VALVES.

Cast Iron Double Beat with

G.P.Beats.

Number of Suction Valves	...	2
" Delivery "	...	2
Diameter of Seat of Suction Valves,		2 Feet
ditto Delivery "		2 " - 2¼ Ins.
Free lift of Valves	...	1 In.

CONDENSER.

Open type with Tubes expanded

into Tube Plates, Condenser

placed in F.P.Suction Tank.

Cooling Surface	... ...	1205 Sq Ft.
No. of ordinary Tubes ..	...	577 Feet

ASHWOOD P.S. (NO. 3. ENGINE)

CONDENSER . continued

Length of ordinary Tubes	...	8 Ft - 3 Ins
Diameter do	...	1 In (Ex. dia)
Thickness do	...	19 B.W.G.

no Stay Tubes or Rods.

Pitch of Tubes	... ...	1½ Ins.
Diameterof Tube Plates .	...	3 Ft - 11¼ Ins
Thickness do .	...	1½ Ins.
Distance apart over Tube Plates ..		8 Ft - 2½ Ins
Diameter of Exhause Inlet	...	17 Ins.
Diameter of Outlet ...	...	9 "

DELIVERY AIR VESSEL.

Total height inside ...	...	20 Ft - 4 Ins.
Diameter " ...	...	3 Ft.
Height above Branches ..	...	18 Ft - 9 Ins.
Thickness of Metal ...	...	2½ Ins.
Working pressure ...	...	190 Lbs.
Capacity above Branches	...	132 C. Ft.
Total Capacity ...	...	144 Co.Ft.

OVERHEAD TRAVELLING CRANE. (HAND POWER).

Made by J.Spencer & Co., Manchester.

Load	... ...	15 Tons
Span	... ...	21 Ft - 2 Ins
Top of Crane Rail from E.H.F.	...	16 " - 2 "

WINCH. 1

Horizontal Steam Type. Made by

J.H.Wilson & Co.Ltd., Liverpool.

Diameter	... ...	8 Ins.
Stroke	... ...	12 "

Barrel - Not Grooved.

ASHWOOD P.S. (NO.3.ENGINE)

WINCH. continued.

Diameter of Wire.Rope ...	$1\frac{1}{16}$	In.
" Barrel ...	18	"
Length do ...	23	"
Diameter of Steam Inlet ...	2	"
" Exhaust Outlet ...	$2\frac{1}{2}$	"
Load to lift double purchase ..	5	Tons.

STEAM RECEIVER. (Between H.P and L.P.Cyls)

Diameter over Flanges ...	3 Ft - 4 Ins.	
Length do ...	11 " - $0\frac{1}{2}$	"
Diameter of Inlet and Outlet ..	13	Ins.
" Reheater Coils in Receiver ...	$1\frac{1}{2}$	" Copper.

STEAM SEPARATOR ON STEAM RANGE.

(In Boiler House between Nos 2 and 3 Engines)

Diameter of Separator ...	18	Ins.
Length do ...	6 Ft - 10 Ins.	

STEAM BOILERS SUPPLIED WITH NO.3.ENGINE - 1906. 3

Lancashire Type - Numbered 6, 7 & 8

Made by H & T Danks, Netherton.

Diameter	8	Feet
Length	30	"
Thickness of Shell Plate ...	$\frac{1}{2}$	In. thick.
" End "	$\frac{9}{16}$	"
Diameter of Internal Flues.Front End	3 Ft - 2 Ins.	
ditto Back "	2 " - 8 Ins	

Thickness of Flue Plates:-

Front End section ...	$\frac{7}{16}$	In.
Intermediate ...	"	"
Back End " ...	"	"

ASHWOOD P.S. (NO.3.ENGINE)

STEAM BOILERS continued.

Manhole	Mc. Neil.
Size	16 In. x 12 In.
Steam pressure - per sq. inch.	80 Lbs.
Total Heating Surface ...	1068 Sq. Ft.
Grate Area	38 Sq. Ft.

MOUNTINGS ON BOILERS

All fittings to be of Hopkinson's make.

One Junction Valve ...	7 Inch bore.
One Anti-Priming Pipe.	
One Compound Safety Valve with plate-weights complete	
One dead weight Safety Valve	3 Ins. dia.
One Check Feed Valve ...	2½ " "
Parallel Slide Blow-off Valve (All bronze)	2½ " "
Fusible Plugs in each Boiler	2

BOILER FEED PUMP ... 1

Made by J.Cameron & Co.

Salford.

Number on Pump - 17204

Type - Double Ram.

Diameter of Ram	6 Ins.
Stroke of Pump ...	6 "
Diameter of Steam Cylinders	8½ "
" Suction "	3½ "
" Discharge "	3 "
" Steam Pipe ..	1 "
" Exhaust " ..	1½ "

C.I.FEED TANK.

Size of Tank - 4 Ft x 4 Ft x 4 Ft.

Berryman Heater in Tank.

Made by J.Wright & Co, Tipton

Type - Horizontal Simplex.

Heating Surface	80 Sq. Ft.
Tubes	Brass.
Diameter of Tubes	1 In. Ex. Dia.
Thickness of Tubes	16 B.W.G.
Valves on Steam Range in Boiler House,	2
Diameter of Steam Range ...	8 Ins.

FITTINGS.

One Standard Stop Valve. 22 In. over Flanges)	7 In. dia.
Diameter of Flanges ...	14½ "
One Cast Steel outside Screw Parallel Slide. Winn's Make. Stop Valve.	2½ "

MAIN BRAKE ON SAFETY TRIP GEAR.

Dia. of Vacuum Destroyer Pipe	2 Ins.
" Pressure Pipe to Brake ..	1 "
" Steam Trip Valve. ..	7¼ "
" C.I.Weights. ..	14 "

RELIEF VALVE ON DELIVERY PIPES

Diameter of Opening ..	6 "

One set of Fishing Tackle for Bucket Pump 18¾ Ins dia.

One Bogie on Lattice Girder for withdrawing Pumps ... ..

GAUGES

One "Open Dial" Borehole Gauge ..	10 Ins dia.
One 4 Sheave Wire Rope Block ..	25 Tons Load
" 2 ditto ..	25 do

ASHWOOD P.S.

GAUGES continued.

Blocks tested to 32 tons.

One Stroke Recorder
Made by G.Kent & Sons, London.

One "Open Dial" Delivery Gauge,
0 - 300 Lbs. 10 In. dia.

One do Steam Pressure Gauge,
0 - 160 Lbs, 10 " "

ASHWOOD PUMPING STATION.

In February 1928 a new 10" X 8½" Westinghouse Air Compressor Class "KF" was fitted, as shown on the arrangement for compounding of existing Westinghouse Air Compressor Drg. No.A211.

VENTURI METERS.

One Messrs.Kent's 1912 Type mercurial combined Recorder installed in the year 1921 on the 18" Pumping Main Throat Ratio 1:9⅜.

One Messrs.Kent's 1912 Type mercurial combined Recorder installed in the year 1921 on the 15" Pumping Main, Throat Ratio 1:10.