


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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TRENT VALLEY PUMPING STATION

246

Situate at Trent Valley

In the County of STAFFORD

S U M M A R Y

Total Engine Power at Station is
equal to 3½ Million Gallons per
24 Hours.

No. 1. Engine. Power per 24 Hours - 1,500,000 Gallons
No. 2. Engine ditto - 2,000,000 do

TOTAL SPECIFIED HEAD. No.1. Engine - 462 Feet
No.2. Engine - 462 Feet

C O S T S

	<u>£.</u>	<u>s.</u>	<u>d.</u>
Land and Law Charges ..	1,509.	12.	6.
Boreholes	3,678.	0.	0.
Engine and Boiler Houses ..	6,030.	7.	7.
Cottage	536.	0.	0.
Engines and Boilers	16,326.	4.	11.
Fencing, Railway Siding, etc.	1,682.	18.	4.
Two VENTURI METERS AND } RECORDERS, INSTALLED 1921.	<u>1,452.</u>	<u>7.</u>	<u>11.</u>
<u>TOTAL COST</u>	<u>£ 31,215.</u>	<u>11.</u>	<u>5.</u>

PUMPING STATION - Commenced 1899

Completed 1905

LAND (3 Acres, 29 Yards)

Purchased from Lichfield Brewery Co.,
in September, 1899.

Level of E.H.F. above O.D. ... 252 Feet

CONTRACTORS

BOREHOLES 1 & 2.

E. Chapman & Sons, ... 1899 - 1901

BOREHOLES 3 & 4

Mather & Platt ... 1903 - 1904

BUILDINGS

Engine & Boiler Houses

T. Lowe & Sons ... 1900 - 1902

Cottage

T. Lowe & Sons, ... 1902

ENGINES & BOILERS

No. 1 Engine & 2 Boilers

Hathorn Davey & Co. 1901

No. 2. Engine.

Hathorn Davey & Co., 1904

NOTE:- Boilers constructed by -

H & T Danks, Netherton.

C O S T S

	<u>£.</u>	<u>s.</u>	<u>d.</u>
Land & Law Charges ...	1,509.	12.	6.
Boreholes 1 & 2.			
Sinking Shaft	2524.	13.	10
Boring "	1620.	0.	0
Plumbing	2.15.	0	
	2,147.	8.	10.
<hr/>			
Ford	£ 3,657.	1.	4.

COSTS (Continued)

	£.	s.	d.
Ford .	3,657.	1.	4.

Boreholes 3 & 4.

Sinking Shaft, £.	286.	8.	2.
Boring ..	1043.	14.	0.
Borehole Castings)	187.	7.	0.
Printing)			
Specification)	13.	2.	0.
	1,530.	11.	2.

Buildings & Engines, with Boilers.

Engine and Boiler Houses,	5,068.	7.	5.
Cottage	536.	0.	0.
Fencing Main Connections) and Railway Siding)	1,682.	18.	4.
No. 1. Engine & 2 Boilers	9,495.	16.	0.
Foundation, No. 2. Engine,	962.	0.	2.
No. 2. Engine ...	6,830.	8.	11.

TWO VENTURI METERS AND RECORDERS
INSTALLED 1921

TOTAL COST	£ 1,452.	7.	11.
	29,763.	3.	4.
	<u>31,215.</u>	<u>11.</u>	<u>3.</u>

ENGINE HOUSE.

Internal Dimensions . Length ...	59 Ft - 0 Ins. ,
Width ...	28 Ft - 6 Ins.
Height to top of Wall Plate ...	24 Ft - 6 Ins.
Depth of Foundations ...	14 Ft - 6 Ins.

BOILER HOUSE

Internal Dimensions ... Length ...	65 Ft - 6 Ins.
Width ...	25 Ft - 0 Ins.

BOREHOLES 1 and 2

Distance apart	20 Feet
No. 1. 30 Ins dia. to depth of,	300 Ft-10 Ins from
18 " " to further do,	500 Ft. do
No. 2. 30 " " to depth of	301 Ft-6Ins do
18 " " to further do	460Ft-5Ins. do

BOREHOLES (Continued)

249

Cast Iron Lining Tubes for) suspending Rising Mains,) concreted round Boreholes) to depth of	39Ft - 3 Ins fro E.H.F.
Inside diameter of Castings ...	3 Feet
Thickness of Metal	1½ Ins.
Top of Boreholes from E.H.F. <i>Engine head</i>	12 Ft - 10 Ins.
Engine Builder's Order Number ...	5687

ENGINE.Triple Horizontal TandemDifferential Surface-Condensing.CAPACITY

Net Quantity per 24 hours
equals 1,500,000 Gallons
at a speed of 140 Feet per
Minute

SPECIFIED HEAD

Maximum Lift in Boreholes ...	300 Feet
Ordinary Working Lift ...	250 Feet
Head on Delivery Main (Including friction)	<u>162 Feet</u>
<u>TOTAL SPECIFIED HEAD</u>	<u>462</u>

Pump Horse Power, at 14 double) Strokes per Minute	145.83
Double Strokes per Minute ...	14.

RISING MAIN OF BOREHOLES 1 & 2

Inside Diameter, Mild Steel Tubing,	16½ Ins.
Length, each M.S. Tube ...	16 Feet
Thickness ditto	½ In.
Diameter, Couplings outside ...	18½ Ins.
Length ditto	9 Ins.

RISEING MAIN OF BOREHOLES 1 & 2 (Continued)

Each Rising Main consists of 17)
 Tubes and 17 Couplings. Tubes)
 and Couplings screwed 8)
 threads per inch)

One Suction Tube to each R.M.

Internal Dia.	...	14	Ins.
Length	...	11 Ft - 11	Ins.
Thickness	...	$\frac{1}{2}$	In.

Joints between Tubes made of

$\frac{3}{8}$ In. dia. Gutta Percha Cord.

CAST IRON WORKING BARRELS

Diameter	...	15 $\frac{1}{2}$	Ins.
Length	...	8	Feet
Thickness of Metal	...	1 $\frac{3}{8}$	In.

Both Ends of Barrel screwed to
receive Rising Main and Suction
Valve Box.

SUCTION VALVE BOX

Diameter, Narrow part	...	15 $\frac{3}{4}$	Ins.
Length,	...	5 Ft - 4	Ins.
Thickness of Metal	...	1 $\frac{1}{2}$	Ins.

Both ends of Box screwed, one end
externally and bottom end internally
to receive Suction Tube

STRAINER (CAST IRON)

Inside Diameter	...	16	Ins.
Length	...	5 Ft - 5	Ins.
Bottom Flange, Dia.	...	30	Ins.

Suction Valve Box fitted with
Gunmetal Seat for Suction Valve
or Clack.

BOREHOLE PUMPS

Single-Acting Pumps actuated by
Compensating Levers and Rods from
Engine Crosshead.

BOREHOLE BUCKET & SUCTION VALVE.

Cast Iron Double Beat with
Gutta Percha Beats.

Diameter, Buckets	...	...	15 $\frac{1}{2}$	Ins.
Stroke do	...	...	5	Feet
Free Lift on Valve of Bucket,	...		1	Inch.
Diameter, Borehole Suction Valves,			15 $\frac{1}{2}$	Ins.
Free Lift on Valve	...	...	1	In.
Diameter, Borehole Rods		...	4	Ins.
" top do		...	4	Ins.
Number Borehole Rod Guides in one)			13	
		lift)		
Diameter, Borehole Guides,	...		15 $\frac{1}{2}$	Ins.
Borehole Rod Couplings,	...		Parallel	
Diameter Steam Cylinders, H.P.			20	Ins.
		I.P.	30	Ins.
		L.P.	44	Ins.
Stroke of Engine	...	...	5	Feet

Cylinders - Steam Jacketted.

PISTON RINGS.

Lancaster & Tonge's Rings
and Springs.

Diameter, Piston Rods, H.P. Front End,		3 $\frac{3}{4}$	Ins.
	I.P. Back and)	5 $\frac{1}{2}$	Ins.
	Front)		
	L.P. Back End.	3 $\frac{3}{8}$	Ins.

PISTON ROD PACKINGS.

Patent Metallic Packing made by
Lancaster & Tonge, Pendleton,
Manchester.

Maker's Number on Packing -

H.P. Cylinder, Front End	...	1888
ditto Back "	...	1890
Intermediate Cylinder	...	1889
Low Pressure	...	1887

ENGINE VALVE GEAR.

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

DIFFERENTIAL GEAR.

Diameter, Water Cylinder	...	11 Ins.
Stroke, Gear	...	8 Ins.
Diameter, Pausing Cylinder	...	4 Ins.
Working pressure per square inch.		70 Lbs.
Test " ditto	...	210 Lbs.
Diameter, Water Piston Rod	...	1 $\frac{3}{4}$ Ins.
Rings in Piston	...	Gutta Percha.
Displacement of Gear Cylinder per Double Stroke	...	5.344 Gallons

AIR PUMP

Two Single-Acting Vertical Pumps
actuated by Lever from Compensating
Levers over Boreholes

Diameter	...	17 Ins.
Stroke	...	14 $\frac{1}{2}$ Ins.
Valves - <u>India Rubber.</u>		
Diameter, Foot Valves	...	13 Ins.

AIR PUMP (Continued)

Diameter, Bucket Valves	...	...	15	Ins.
" Bucket Rods	...	...	2 $\frac{1}{2}$	Ins.
Diameter, Inlet	...	...	5	Ins.
" Outlet	...	...	3	Ins.

Packing round Air-Pump Bucket -
 $\frac{1}{2}$ " Diameter Rope

FORCE PUMPS.

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

Diameter, Piston	...	...	15 $\frac{1}{2}$	Ins.
Stroke "	...	...	5	Feet
Diameter Piston Rod, (Front End)	...	...	3 $\frac{1}{2}$	Ins.
Working pressure per sq. inch	...	...	70	Lbs.
Test " do	...	...	200	Lbs.
Gallons discharged per double stroke.	...	...	76.892.	
Multiplier given to Foreman	...	...	77	
Excess discharge of Borehole Pumps over Force Pumps	...	...	5.83.	%

FORCE PUMP VALVES

Cast Iron Double-Beat with Gutta
Percha Beats

Number, Suction Valves	...	...	2	
" Delivery do	...	...	2	
Diameter, Seat of Suction Valves	...	...	1 Ft - 9	Ins.
" " Delivery Valves	...	...	1 Ft - 11 $\frac{1}{2}$	Ins.
Free Lift of Valves	...	...	1	Inch

CONDENSER

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

CONDENSER (Continued)

Cooling Surface	...	...	320 Sq. Ft.
Ordinary Tubes, Number	...	...	187
Length	...	...	6 Ft - 7½ Dns.
(Ext) Diameter	...	...	1 In.
Thickness	...	...	19 B.W.G.
Stay Rods on Tubes	...	...	0
Pitch of Tubes	...	...	1½ Ins.
Diameter, Tube Plates	...	...	2 Ft - 5½ Ins
Thickness do	...	...	¾ In.
Distance apart over Tube Plates	...	...	6 Ft - 7 Ins.
Diameter, Exhaust Inlet	...	...	8 Ins.
" Outlet	...	...	5 Ins.

DELIVERY AIR VESSEL. (CAST IRON)

Total Height inside	...	...	14 Ft - 6 Ins.
Diameter "	...	...	2 Ft - 10 Ins.
Height above Branches	...	...	13 Ft - 3 Ins.
Thickness of Metal	...	...	1 In.
Working pressure per sq. Inch	...	...	70 Lbs.
Capacity above Branches	...	...	84 C. Ft.
Total Capacity	...	...	91 C. Ft.

STEAM RECEIVER

Acting as Re-heater between H.P.
and I.P. Cylinders.

Diameter	...	...	16½ Ins.
Length	...	...	8 Ft - 6 Ins.
Diameter, Copper Coil	...	...	1½ In. Bore.

STEAM RECEIVER.

Acting as a re-heater between

I.P. and L.P. Cylinders

Diameter,	20½ Ins
Length	9 Ft - 10½ Ins
Diameter, Copper Coil	1½ In. Bore.

OVERHEAD TRAVELLING CRANE.

Made by Garrick & Ritchie, Edinburgh.

Load to carry	10 Tons
Span	28 Ft - 6 Ins.
Height from E.H.F. to top of Crane Rail,	20 Feet
Diameter, Barrel on Crab	16 Ins

WINCH FOR BOREHOLE WORK 1

Horizontal Steam type, made by -

Diameter, Cylinders	7 Ins.
Stroke, Winch	12 Ins.
Steam Inlet	2 Ins.
Exhaust Outlet	2 Ins.

AIR COMPRESSOR

Made by Westinghouse Brake Co.

London.

Single-Stage. Size 8" / 3½ Ins.

Class "F"

Diameter, Steam Inlet	1 In.
" Exhaust Outlet	1½ In.
" Air Delivery	¾ In.
Maker's Name Plate. Number	35235
London Works do	11854

AIR CHARGER ON AIR VESSEL.Wipperman & Lewis type, made byWipperman & Lewis, Manchester.Size, "A"

Diameter, (Suction Pipe)	...	1	Inch
" (Delivery Pipe)	...	$\frac{1}{2}$	Inch.

SAFETY GEAR ON MAIN BRAKE

Diameter, Weight	...	9 $\frac{1}{2}$	Ins.
Weight of Weight, with ram and rod,		232	Lbs.
Diameter, Vacuum Spoiler Pipe	...	1 $\frac{1}{4}$	Ins.
" Throttle Valve	...	4 $\frac{1}{2}$	Ins.

FEED PUMPS 2Vertical Direct Acting, made byLee Howl & Co, Tipton.Maker's No. on Pumps - 3792-3793.

Size, Steam Cylinder	...	5	Ins.
" do, Water End	...	3	Ins.
Stroke, Pumps	...	12	Ins.
Size, Suction	...	2	Ins.
" Delivery	...	2	Ins.

FEED WATER TANK (Cast Iron)

Size,	...	4 Ft X 4 Ft X 4	Ft.
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FEED WATER HEATER IN TANKDesigned by South StaffordshireWaterworks Company.Made by J. Tickle & Co. Ltd.West Bromwich.

FEED WATER HEATER (Continued)

Heating Surface	...	...	27.48 Sq. Ft.
Number of Tubes	1...	...	42
External Diameter of Tubes	...	...	1 In.

FEED WATER FILTER on Feed Water Main.

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

Maker's Number on Filter	...	1419
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LUBRICATORS.

One Sight Feed Lubricator for Internal lubrication of Main) Engine No. 1. Maker's Number) Maker - C. Winn & Co.	...	1095
One 1/3 Pint Winn's Victor Sight Feed Lubricator for <u>Economiser</u> <u>Engine.</u> Maker's Number ...	...	3566
One ditto for <u>Stoker Engine</u> Maker's Number ...	...	3567
One ditto for Feed Pumps Maker's Number ...	...	3147
Two 20 Ton, 3 Sheave, Wire Rope Blocks for Borehole Work. Diameter of Blocks	...	15 Ins.

STEAM BOILERS 2

Lancashire type, made by -

H & T Danks, Netherton.

Diameter	...	...	8 Feet
Length	...	...	30 Feet
Thickness, Shell Plate	...	...	$\frac{3}{4}$ In.
" End Plate	...	...	$\frac{3}{4}$ In.
Diameter, Internal Flues. Front End,	...	...	3 Ft - 2 Ins.
Back End,	...	...	2 Ft - 9 Ins.
Thickness of Flues. Front End Sec'n,	...	...	$\frac{5}{8}$ In.
Intermediate "	...	...	9/16 in

STEAM BOILERS (Continued)

Thickness of Flues, Back End	$\frac{5}{8}$ In.
Size of Circular Manhole ...	16 Ins.
Steam Pressure per sq. inch ...	150 Lbs
Total Heating Surface ...	1068 Sq. Feet

MOUNTINGS ON EACH BOILER

One Patent Compound High Pressure and Low Water Safety Valve, loaded to 150 Lbs per sq. inch (Hopkinson type)	
One Dead Weight Safety Valve loaded to blow off at 150 lbs per sq. inch.	2 $\frac{1}{2}$ Ins dia.
One Cast Iron Anti-Priming Pipe	
One Check Feed Valve ...	2 $\frac{1}{2}$ Ins "
One Gunmetal Blow-off Cock ...	2 $\frac{1}{2}$ Ins "
Two Sets Dewrance's Transparent Water Level Indicators, with Spigots -	$\frac{3}{4}$ In. "
One Brass engraved Working Level Pointer.	
One 10 inch Bourdon Pressure Gauge.	

NOTE:- No Stop Valve is attached directly to the mounting on Boiler.
In order to shut down each Boiler it is necessary to close two Valves on Steam Range, one either side of Stand-Pipe on Boiler.

STOP VALVES ON STEAM RANGE IN BOILER HOUSE

Two Hopkinson-Ferranti Patent Steam Valve, Fig. 2029.	Dia. 7 Ins.
Four Glenfield & Kennedy's Wedge type Steam Valves, Figure A. 225.	Dia. 7 Ins.

SUPERHEATERS attached to Boilers (See next page)

SUPERHEATERS ATTACHED TO BOILERS,

2

Made by Hathorn Davey & Co.

Diameter, Tubes	...	...	1½ In. Bore.
Number "U" Tubes	...	...	24
Heating Surface	...	...	192 Sq. Ft.
One Relief Valve on each Superheater,	1½ Ins. dia.		

ECONOMISER & ENGINE

Made by E. Green & Sons, Wakefield.

Number of Tubes	...	...	72
Engine (for drawing Scrapers on Economiser)			

MECHANICAL STOKERS

Made by T & T Vicars, Earlestown.

Maker's No. on Boiler No. 1.	4545 - 4546
ditto No. 2.	4547 - 4548

Particulars on Name Plate of Stoker Engine

T & T Vicars,

No. 35773.

Size, 6 Ins X 4½ Ins.

Earlestown.

BOREHOLES 3 and 4

Distance apart ...	20 Feet
No. 3. 30 In. dia. to depth of,	304 Ft-6 Ins from E.H.F.
18 In. dia. to further do	457 Ft do
No. 4. 30 In. dia. to depth of,	303 Feet do
18 In. dia. " further do	461 Feet do
Cast Iron Lining Tubes for suspending Rising Mains concreted round Boreholes to depth of ...	40 Feet
Inside diameter of Castings ...	3 Feet
Thickness of Metal ...	1½ Ins.
Top of Boreholes from E.H.F. ...	10 Feet
Engine Builder's Order Number ..	6058

ENGINETriple Horizontal-TandemDifferential Surface Condensing.CAPACITYNet Quantity equals 2,000,000Gallons per 24 hours at a speed
of 140 Feet. per Minute.SPECIFIED HEAD

Maximum Lift in Boreholes ...	300 Feet
Ordinary Working Lift ...	200 Feet
Head on Delivery Main (including friction)	162 Feet
<u>TOTAL SPECIFIED HEAD</u>	<u>462 Feet</u>
Pump Horse Power ...	194.4
Double Strokes per Minute ...	14
Diameter, Steam Cylinders, H.P.	20 Ins.
" ditto I.P.	30 Ins
" ditto L.P.	46 Ins

SPECIFIED HEAD (Continued)

Stroke of Engine ... 5 Feet

Cylinders - Steam Jacketted.

PISTON RINGS.

Lancaster & Tonge's Piston
Rings and Springs

PISTON RODS

Diameter, H.P. Front End ...	4 1/2	Ins.
" H.P. Back End, and I.P. Front End)	5 1/2	Ins.
" I.P. Back and L.P.) Front End)	6	Ins.
" L.P. Back End ...	4	Ins.

PISTON ROD PACKINGS.

Made by Lancaster & Tonge,
Pendleton, Manchester.
Patent Metallic Packing.

Maker's Number on each Packing -

H.P. Cylinder, Front End,	2122
H.P. do Back End,	2124
Intermediate Cylinder,	2126 a
L.P. Cylinder ...	2123

ENGINE VALVE GEAR

The Valves to be actuated in
accordance with Davey's Patents.
Valve Gear to be steam driven.
Slide Valves fitted with Meyer's
Cut-off and adjustable by hand.

DIFFERENTIAL GEAR.

Diameter, Steam Cylinder	...	8	Ins.
" Water do	...	8	Ins.
Stroke of Gear	...	8	Ins.
Diameter, Steam Piston Rod	...	1 $\frac{3}{4}$	Ins.
" Water do	...	1 $\frac{3}{4}$	Ins.

No. Rings in Water Piston.

Piston Ring in Steam Cylinder -

Goodfellow's.

RISING MAINS OF BOREHOLES 3 & 4.

Inside dia., Mild Steel Tubing...	18 $\frac{3}{4}$	Ins.
Length of each M.S. Tube	15	Feet
Thickness do	5/8 & 1/2	In.
Diameter, Couplings outside	20	Ins.
Length do	12	Ins.
One Suction Tube to each R.M. (inside)	16	Ins dia.
Length of Tube	15	Feet
Thickness of Tube	5/8	In.

Each Rising Main consists of 18
tubes and couplings, the top half
being 5/8 In. thick, and the lower
1/2 Inch thick.

Tubes and Couplings screwed 8 threads
per inch.

Joints between Tubes made of 3/8 In. dia.

Gutta Percha Cord.

WORKING BARRELS (CAST IRON)

Diameter	...	17 $\frac{3}{4}$	Ins.
Length	...	8 Ft - 11	Ins.
Diameter, Flange on bottom of)	...	26	Ins.
barrel)			
Thickness of Metal	...	1 $\frac{1}{2}$	Ins.

WORKING BARRELS (Continued)

Top end of Barrel is screwed
into Rising Main, and lower
end flanged to Receive
Suction Valve Box.

SUCTION VALVE BOX.

Diameter, Narrow part	...	18	Ins.
Length	... ..	5 Ft - 6	$\frac{1}{2}$ Ins.
Thickness of Metal	...	1	$\frac{1}{2}$ Ins.

One end of Box flanged for
Working Barrel, and lower end
screwed to receive Suction Tube.

CAST IRON STRAINER

Ext. Dia.	... ..	2 Ft - 6	Ins.
Length	... ..	5 Ft - 5	Ins.

Suction Valve Box fitted with
a Gunmetal Seat for Suction
Valve or Clack.

BOREHOLE PUMPS

Single-Acting Pumps actuated by
Compensating Levers and Rods from
Engine Crosshead.

BOREHOLE BUCKET & SUCTION VALVE.

Cast Iron Double-Beat with
Gutta Percha Beats

Diameter, Borehole Bucket...	...	17	$\frac{1}{2}$ Ins.
Stroke	... ..	5	Feet
Free lift of Valve on Bucket.	...	$\frac{1}{8}$	In.

BOREHOLE BUCKET & SUCTION VALVE (Continued)

Diameter, Borehole Suction Valve,	17 $\frac{1}{2}$	Ins.
Free Lift of Valve on do	$\frac{7}{8}$	Ins.
Diameter, Borehole Rods ...	4 $\frac{3}{4}$	Ins.
Diameter top do ...	4 $\frac{3}{4}$	Ins.
Number Borehole Rod Guides in) one lift)	18	Ins.
Diameter, Borehole Guides ...	17 $\frac{3}{4}$	Ins.

Borehole Rod Couplings - Tapered.

AIR PUMP.

Two Single-Acting Vertical Pumps

actuated by lever from

Compensating Levers over Boreholes.

Diameter	...	...	17	Inches
Stroke	...	...	14 $\frac{1}{2}$	Ins.
Diameter, Foot Valves	...	...	13	Ins.
" Bucket "	...	...	15	Ins.
" Bucket Rods	...	...	2 $\frac{1}{2}$	Ins.
" Inlet	...	...	5	Ins.
" Outlet	...	...	3	Ins.

Valves - India Rubber.

Packing round Pump Bucket, $\frac{1}{2}$ In. dia.

rope.

FORCE PUMPS.

Double-Acting Piston Pump driven

by L.P. Piston Tail Rod.

Diameter, Piston	...	...	17 $\frac{3}{4}$	Ins.
Stroke do ...	...	...	5	Feet
Diameter Piston Rod (front end)	...	...	4	Ins.
Working pressure per sq. inch,	...	...	150	Lbs.
Test do do	...	...	450	Lbs.
Gallons discharged per double) stroke	...	...	104.4	

FORCE PUMPS (Continued)

Multiplier given to Foreman, ...	104
Excess of Discharge of Borehole Pumps over Force Pumps ...	2.6 %

FORCE PUMP VALVESCast Iron Double Beat with GuttaPercha Beats

Number, Suction Valves ...	2
" Delivery do ...	2
Diameter Seat of Suction Valves .	2 Ft - 0 Ins.
" " Delivery do...	2 Ft - 2½ Ins.
Free Lift of Valves ...	1 In.

CONDENSEROpen type with Tubes expanded intoTube Plates. Condenser placed inForce Pump Suction Tank.

Cooling Surface ...	495 Sq. Ft.
Ordinary Tubes. Number, ...	253
Length ...	7 Ft - 8½ Ins.
(Ext.) Diameter ...	1 In.
Thickness ...	19 B.W.G.
Stay Rods or Tubes ...	0
Pitch of Tubes ...	1½ Ins.
Diameter, Tube Plates ...	2 Ft - 9½ Ins
Thickness do ...	1 In.
Distance apart over Tube Plates .	7 Ft - 8 Ins.
Diameter, Exhaust Inlet ...	8 Ins.
" Outlet ...	5 Ins.

DELIVERY AIR VESSEL (CAST IRON)

Total Height inside ...	14 Ft - 6 Ins.
Diameter " ...	3 Feet

DELIVERY AIR VESSEL (Continued)

Height above Branches	...	13 Ft - 2 Ins.
Thickness of Metal	...	2 $\frac{1}{8}$ In.
Working pressure per sq. inch .		150 Lbs.
Capacity above Branches	...	93 C. Ft.
Total Capacity	... ..	102 C. Ft

OIL SEPARATOR ON EDUCTION PIPE (VERTICAL)

Made by Baker Oil Separator Co. Ltd.

Leeds

Diameter	... ..	4 Ft - 0 Ins.
Length	... ..	6 Ft - 0 Ins.
Capacity. Steam dealt with per hour,		7500 Lbs.
Diameter, Steam Exhaust openings,		8 Ins.

OIL PUMP FOR OIL SEPARATOR

Made by Baker Oil Separator Co.,

Leeds.

Stroke of Pump	... ..	4 $\frac{1}{2}$ Ins.
Oil Tank for Oil Separator	...	2 Ft X 2 Ft X 2 F

AIR CHARGER ON AIR VESSEL

Made by Hathorn Davey & Co, Leeds

Wipperman & Lewis type

Diameter, Delivery Pipe	...	$\frac{3}{8}$ In.
-------------------------	-----	-------------------

SAFETY TRIP GEAR OR MAIN BRAKE

Diameter, Weight	... ..	11 Ins.
" Steam Valve	...	4 $\frac{3}{8}$ Ins.
" Vacuum Spoiler Pipe	...	2 Ins

To relieve at 130 and 40 lbs per square inch.

STEAM TRAPS ON JACKET PIPING

Number fixed	...	...	3
Size	...	...	$\frac{3}{4}$ In.

Lancaster & Tonge's "Bucket
Type."

LUBRICATOR

One Sight Feed Lubricator made by)
Messrs C. Winn & Co of B'ham,)
for internal lubrication of)
Main Engine No. 2. Maker's)
Number, 2008.)

WINCH over Nos. 3 and 4 BOREHOLE

Horizontal Steam Type made by
J.H. Wilson & Co, of Liverpool.

Diameter, Cylinders	...	...	8 Ins.
Stroke, Engine	...	...	12 Ins.
Diameter, Barrel	...	...	18 Ins
Length do	...	...	23 Ins
Diameter, Steam Inlet	...	...	1 $\frac{1}{2}$ Ins.
" Exhaust Outlet	...	...	2 Ins.
Load to lift in Double Purchase			5 Tons.
Height, Delivery Main Pressure Gauge, from E.H.F.	...	...	5.125 Feet