


S. S. W. W.

DESCRIPTION OF PUMPING STATIONS
1921.

VOL. I

FRED. J. DIXON, M. INST. C.E.
ENGINEER.

SOUTH STAFFORDSHIRE WATERWORKS COMPANY.

PUMPING STATIONS.

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MAPLE BROOK PUMPING STATION.

NEAR LICHFIELD IN THE COUNTY OF STAFFORD.

S U M M A R Y.

The total power at Station is equal to 4 million gallons per 24 hours.

No.1 Engine power per 24 hours at 20 revs. per min. 2,000,000 galls.

"H.K.Beale" Engine " " " " " " " " 2,000,000 "

Total specified head No.1 Engine. 606 feet.

Total specified head "H.K.Beale" Engine. 582 feet.

COSTS.

	£.	s.	d.
Land and Law Charges.	674.	16.	2.
Four Boreholes @ Sundry Charges.	14843.	17.	7.
Engine House, Boiler House, Stock, etc.	6,804.	0.	11.
Cottage.	452.	0.	0.
Electric light, Main Conn. & Sundry Charges.	2251.	18.	6.
Foundations for "H.K.Beale" Engine.	1475.	8.	0.
No.1 engine, 3 Boilers, Crane etc.	16068.	15.	11.
Sundry Charges.	201.	14.	3.
"H.K.Beale" Engine.	37816.	0.	0.
Sundry Charges.	1954.	13.	6.
TOTAL COST.	<u>82543.</u>	<u>4.</u>	<u>10.</u>

AMENDED COPY MARCH 1932

MAPLE BROOK PUMPING STATION

situate near

LICHFIELD in the County of STAFFORD.

S U M M A R Y

Total Engine Power at Station (with Duplicate Engine) is equal to Four Million Gallons per 24 hours.

No. 1. Engine. Power per 24 hours = 2,000,000 Gallons.
H. K. Beall
 No. 2. " ditto = 2,000,000 "

TOTAL SPECIFIED HEAD.

No. 1. Engine - 606. Feet.
H. K. Beall
 No. 2. " - 582. "

C O S T S

	<u>£.</u>	<u>s.</u>	<u>d.</u>
Land and Law Charges ...	405.	5.	8.
Nos. 1 & 2 Boreholes ...	5,224.	2.	11.
Engine & Boiler Houses ...	7,032.	5.	11.
Cottage ...	400.	0.	0.
No. ² 1. Engines & 3 Boilers ...	16,270.	10.	2.
Levelling & Fencing ...	1,422.	12.	9.
Main Connections ...	252.	17.	4.
Electric Light Installation,	275.	4.	5.
	<u>61,971.</u>	<u>17.</u>	<u>10.</u>
<u>TOTAL COST</u>	£ 31,282.	17.	2.

Cost of Venturi Recorder (1920) £ 431. 0. 0.

COSTS (Continued)

NOTE:- No particulars of the duplicate Engine, or cost of same, are included in this Statement.

PUMPING STATION - Commenced. - 1909
Completed. - 1923.

LAND. (2 Acres) (1st Piece)

Purchased from Sherratt's Trustees
in May, 1908.

2nd Piece. Purchased 21st November, 1921. from
Sherratt's Trustees. 3 acres
Level of E.H.F. above O.D. ... 485.91 Feet.

CONTRACTORS.

BOREHOLES. Nos. 1 & 2.

A.C. Potter & Co., ^{grantham} London. 1910 - 1912.
^{Boreholes nos. 3 & 4.}
A.C. Potter & Co., ^{grantham} 1917 - 1922.

BUILDINGS

ENGINE & BOILER HOUSES .

B. Whitehouse & Sons, 1913 - 1915.
Birmingham.
^{Foundations for second Engine by South Staffordshire}
^{Waterworks Company.}

COTTAGE

ditto

ENGINES.

NO. 1. ENGINE & 3 BOILERS.

Galloway Ltd., Manchester 1914 - 1915.

^{H. K. Beale Engine.}
NO. 2. ENGINE.

Glenfield & Kennedy Ltd, 1921. - 1922.
Kilmarnock.

MAIN CONNECTIONS

G. Law, Kidderminster. 1914. (November)
¹⁹¹⁴
^{No. 1. Engine.}

C O S T S

LAND.

	£	s	d
Land and Law Charges ...	674	16	2
	405.	5.	8.

NO. 1. BOREHOLE.

Sinking shaft and Boring ...	1,334.	16.	8.
Lining Tubes ...	768.	6.	0.
Test Pumping <i>not Borehole.</i> ...	1,304.	6.	11.

NO. 2. BOREHOLE

Sinking Shaft & Boring ...	1,069.	3.	4.
Lining Tubes ...	747.	10.	0.

BUILDINGS

Engine and Boiler Houses ...	7,032.	3.	11.
Cottage (Estimated) ...	400.	0.	0.
<i>Foundations of "H.K. Seale" Engine.</i> Levelling and Fencing ...	1,475		
	1,422.	12.	9.

Main Connections <i>No. 1 Engine.</i> <i>"H.K. Seale"</i> ...	252.	17.	4.
	125.	1.	0.

EE <u>ENGINE (NO. 1. AND BOILERS)</u> ...	16,270.	10.	2.
--	---------	-----	----

<u>ELECTRIC LIGHTING INSTALLATION</u> ..	455	18	1.
	275.	4.	5.

<u>VENTURI RECORDER</u> (G. Kent's) Installed 1920)	431.	0.	0.
--	------	----	----

<u>TOTAL COST.</u>	£ 31,713.	17.	2.
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EE DETAILS OF TENDER FOR ENGINE

	£	s	d
3 Boilers ...	2,000.	0.	0.
3 Superheaters & Pipes, Overhead Crane ...	500.	0.	0.
	507.	0.	0.
2 Steam Winches & Pipes	300.	0.	0.
2 Feed Pumps & Pipes	150.	0.	0.
Feed Water Tank & Heater	50.	0.	0.
Non-Conducting Material,	100.	0.	0.
Westinghouse Air Compressor	50.	0.	0.
Stairs to Basement	40.	0.	0.

TOTAL	£ 3,797.	0.	0.
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GOST OF "H.K. BEALE" ENGINE.

SCHEDULE OF PRICES.

Brought fwd.

£. s. d.
43,373. 17. 10.

142

One inverted Vertical Triple Expansion Engine with Borehole & Force Pumps as per Tender dated 16th December, 1919.

32,980. 0. 0.

Alterations to Borehole Pumps as per Contractor's letter dated 20th January, 1920.

930. 0. 0.

One Portable Pressure Recorder for Boreholes.

27. 0. 0.

Alterations to Force Pumps as per Contractor's letter dated 21st February, 1920.

500. 0. 0.

Additional Steam Pipes, valves &c. for ring main as per Contractor's letter dated 11th May, 1920.

530. 0. 0.

Two additional lengths of rising main with pump rods &c.

250. 0. 0.

Altering force pump valves from taper to screwed seats.

60. 0. 0.

I.F.

Additional cost due to alteration in design of reheating receivers.

300. 0. 0.

Extra costs incurred due to increases in the cost of material and labour as per Contractor's letter dated 13th February, 1922.

3,452. 0. 0.

Total cost of Station £82,402. 17. 10.

I.F.

ENGINE HOUSE

Internal Dimensions. Length ... 56 Ft - 6 Ins.
do Width ... 54 Ft - 9 Ins.
Height to top of Wall Plate ... 33 Ft - 8 Ins.
Depth of Foundations ... 17 Ft - 0 $\frac{1}{2}$ Ins.

BOILER HOUSE

Internal Dimensions. Length ... 64 Ft - 1 In.
do Width ... 38 Ft - 0 Ins.

Height of Chimney
BOREHOLES (NOS. 1 and 2.) *Area at top* 120 ft.
bottom 23 sq ft.
33 sq ft

Distance apart ... 36 Ft - 6 Ins.

No. 1. BOREHOLE

36 ins dia. to depth of ... ~~123~~¹²¹ Ft from E.H.F.
33 " " to further)
depth of) ... 306 Ft do
24 " " ditto ... ~~632~~^{670.5} Ft do

NO. 2. BOREHOLE.

36 ins dia. to depth of ... 123 Ft do
33 " " to further)
depth of) ... 306.75 Ft do
24 " " ditto ... 632 Ft. do

Both Boreholes are lined with

Mild Steel Tubes to a depth of 300 Feet.

Internal dia. Top portion Lining) Tubes) 33 Ins.
ditto Bottom ditto 30 $\frac{1}{2}$ "

Cast Iron Lining Tubes for)
suspending Rising Mains,)
concreted round Boreholes)
to a depth of ...) 41 Ft from E.H.F
Inside diameter of Castings 3 Feet.
Thickness of Metal ... 1 $\frac{1}{2}$ Ins.

BOREHOLES (Continued)

Top of Boreholes from E.H.F. ... 17 Feet
 Distance of ground line from E.H.F., 6 Feet

ENGINE NO. 1.

Inverted Triple-Expansion Surface-
 Condensing Rotative Pumping Engine
 with Flywheels at each end of Engine.

CAPACITY OF ENGINE

Net Quantity per 24 hours -
 2,000,000 gallons at 20
 revolutions per minute.

SPECIFIED HEAD.

Maximum Lift in Boreholes ...	300 Feet
Ordinary Working Lift ...	225 "
Head on Delivery Main (including friction)	306
<u>TOTAL SPECIFIED HEAD</u>	<u>606 Feet</u>
Pump Horse Power, at 20 Revs.	255
Speed per Minute ...	20 revs.

RISING MAIN, BOREHOLES 1 AND 2.

Inside diameter, Mild Steel Tubing,	16 Ins.
Length each Mild Steel Tube,	15 Feet
Thickness, 1st 9 lengths ..	$\frac{5}{8}$ In.
" 2nd 8 do ..	$\frac{1}{2}$ In.
Diameter outside Couplings ..	18 $\frac{1}{2}$ Ins.
Length ditto ..	9 Ins.

Each Rising Main consists of
 17 tubes and 16 couplings.
 Tubes and Couplings screwed
 8 threads per inch.

MAPLE BROOK P.S. (CAST IRON)

(IN EACH RISING MAIN)

144

Diameter	...	...	15½ Ins.
Length	...	...	8 Ft. - 6 Ins.

PERMANENT WORKING BARRELS. (CAST IRON)

Diameter	...	...	15 Ins.
Length	...	...	8 Feet.
Diameter, Flanges	...	...	23½ Ins.
Thickness	...	...	3 Ins.
Thickness (Metal)	...	...	1½ Ins.

SUCTION VALVE BOXES (CAST IRON)

Diameter, Narrow part	...	...	15 Ins.
Length	...	...	5 Ft - 9 Ins.
Thickness of Metal	...	...	1½ Ins.
Top Flange	...	...	23½ Ins.
Bottom Flange	..	...	20¾ Ins.

STRAINERS (CAST IRON)

Diameter (inside)	...	...	14 Ins.
Length	...	...	10 Feet.
Flange	...	...	20¾ Ins.

Suction Valve Boxes Fitted
with Gunmetal Seats for
Suction Valves or Clacks.

BOREHOLE PUMPS

Single-Acting Pumps actuated
from Crankshaft by Cranks, One
each end of engine.

BOREHOLE BUCKET AND CLACK.

Gunmetal "Pernis" on Multi-
annular type with leather
beats.

BOREHOLE BUCKET & CLACKS (continued)

Diameter, Borehole Buckets ...	15	Ins.
Stroke ditto ...	5	Feet
Number Valve Rings on Bucket .	5	
Lift ... do ...	$\frac{3}{8}$	Ins.
Diameter, Borehole Clacks ...	$14\frac{5}{8}$	Ins.
Number Valve Rings on Clack ..	6	
Lift ditto ...	$\frac{3}{8}$	Ins.
Diameter, Borehole Rods ...	$3\frac{5}{8}$	Ins.
" Top ditto ...	$5\frac{1}{2}$	Ins
Number Borehole Rod Guides in) one lift)	17	
Diameter Borehole Guides ...	$15\frac{1}{2}$	Ins

Borehole Rod Couplings

Tapered.

FORCE PUMP.

Single-Acting Plunger, three
in number.

Diameter, Plunger ...	$13\frac{1}{2}$	Ins.
Stroke do ...	4	Feet.
Capacity of one Plunger ...	24.78	Gallons
Gallons discharged per revolution (theoretical).	74.358	
Multiplier given to Foreman...	74	
Excess of discharge of Borehole) Pumps over Force Pumps)	3.8%	

FORCE PUMP VALVES

Phosphor Bronze Valves and
Seats of the Multi-annular
type with Gutta Percha Beats

Number of Suction Valves, in all,	90
" Delivery " "	84

FORCE PUMP VALVES (Continued)

Diameter, Screwed part Valve Seats, 4 In. Gas
 Free lift of Valves ... $\frac{1}{2}$ In.

CONDENSER.

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

Cooling Surface	...	..	590.06 Sq. Ft.
Number Ordinary Tubes	.	..	292
Length	ditto	...	7 Ft - $8\frac{1}{4}$ Ins.
Diameter	ditto	(external).	1 In.
Thickness	ditto	...	19 B.W.G.
Number, Stay Tubes	....	..	9
Diameter	ditto	(external)	1 In.
Length	ditto	...	7 Ft - $10\frac{1}{4}$ Ins
Thickness	ditto	...	$\frac{3}{16}$ In.
Pitch of all Tubes	...	..	$1\frac{3}{4}$ Ins.
Diameter, Tube Plates	.	..	3 Ft - 4 Ins.
Thickness,	ditto	...	1 In.
Distance apart over Tube Plates			7 Ft - 6 Ins.
Diameter, Exhaust Inlet		..	10 Ins.
"	Outlet	...	6 Ins.

AIR PUMP

Independent Steam Driven

/"Edwards" type /

Made by Edwards Air Pump Syndicate, Ltd.

Diameter, Bucket	...	..	13 Ins.
Stroke	do	...	8 Ins.
Diameter, Steam Cylinder		..	6 Ins
Stroke	do	...	8 Ins.

AIR PUMP (Continued) (VALVES - Kinghorn Metallic. 3 Ply

Revolutions per minute	...	120
Number Valves on Head Plate	..	6
Diameter, Valve Guards	...	3 $\frac{1}{2}$ Ins.
" Piston Rod	...	1 $\frac{3}{8}$ Ins.
" Piston Slide Valve	.	2 Ins.
" ditto Spindle,		$\frac{3}{4}$ In.
" Inlet to Pump	...	5 Ins.
" Outlet from Pump	...	4 Ins.
" Steam Inlet	...	1 $\frac{1}{4}$ Ins.
" Exhaust Outlet	...	1 $\frac{1}{2}$ Ins.

STEAM CYLINDERS.

Diameter, H.P. Cylinder	...	22 Ins.
" I.P. do	...	35 Ins.
" L.P. do	...	55 Ins.
Stroke of Engines	...	4 ft. 0 Ins.
Diameter, Piston Rod, H.P.	...	5 Ins.
" do I.P.	...	5 Ins.
" do L.P.	...	5 Ins.

Piston Rings - Buckley's No.2.

PISTON ROD PACKINGS (METALLIC)

Made by - The United States Metallic Packing Co. Ltd., Bradford.

Maker's No. on H.P.	...	87293.
ditto I.P.	...	87294.
ditto L.P.	...	87295.

Steam Cylinders are not jacketted.

ENGINE VALVE GEAR.

Corliss gear of the "Dobson" type
actuated from Crankshaft by
eccentrics and rods and Trip Gear
with noiseless Dashpots.

PACKING, VALVE SPINDLES.

Made by - The United States Metallic
Packing Co. Ltd, Bradford.

Maker's Numbers on Packings as under -

H.P. Top Steam	...	87296.
H.P. Bottom Steam	...	87297.
H.P. Top Exhaust	...	87298.
H.P. Bottom Exhaust	...	87299.
I.P. Top Steam	...	87300.
I.P. Bottom Steam	...	87301.
I.P. Top Exhaust	...	87302.
I.P. Bottom Exhaust	...	87303.
L.P. Top Steam	....	87304.
L.P. Bottom Steam	...	87305.
L.P. Top Exhaust	...	87306.
L.P. Bottom Exhaust	...	87307.

Diameter, Connecting Rod Crank Pins,	12	Ins.
" do Crosshead Pins,	9	Ins.
" Crank Shaft	...	13 Ins.

FLYWHEELS (CAST IRON) ... 2

Made in Halves.

Diameter	...	14 Feet
Width of Rim	...	14 Ins.
Internal diameter of Boss	...	17½ Ins.

DELIVERY AIR VESSEL (MILD STEEL).

Total height inside	...	18 Ft - $7\frac{7}{8}$ Ins.
Diameter	"	4 Feet.
Height above Branches	...	16 Ft - $6\frac{1}{8}$ Ins.
Thickness of Metal	...	$\frac{3}{8}$ In.
Working pressure per square inch.		132 Lbs.
Capacity above Branches	...	206 Cu. Ft.
Total Capacity	...	238 Cu. Ft.

OVERHEAD TRAVELLING CRANE.

Made by R.C.Gibbons & Co,

Birmingham - No. 30b.

Load	...	12 Tons.
Span	...	53 Ft - $7\frac{1}{2}$ Ins.
Height from E.H.F. to top of)		24 Ft - $8\frac{1}{8}$ Ins.
	Crane Rail)	

BLOCKS ON CRANE

One 4 Sheave, 20 Ton Wire Rope)		15 Ins dia. (Sheave)
	Block)	
One 3 do 20 Ton ditto		15 " dia do

These Blocks are suitable for

1 Inch diameter Wire

Rope.

WINCHES. 2

Made by - J.H.Wilson & Co,

Liverpool.

Diameter, Cylinders	...	7 Ins.
Stroke do	...	12 Ins.
Diameter, Wire Rope	...	1 In.
" Barrel	...	18 Ins.
Length do	...	$21\frac{3}{4}$ Ins.

WINCHES (Continued)

Diameter, Steam Inlet	...	1 $\frac{3}{4}$ Ins.
" Exhaust	...	2 $\frac{1}{4}$ Ins.

Barrels - Grooved.

BARRING ENGINE.

Double-Geared "C" Size.

2 Cylinders made by Hick-

Hargreaves & Co, Bolton.

Diameter of Cylinders	...	10 Ins.
Stroke of Engine	...	7 $\frac{1}{2}$ Ins.
Maker's number on Spur Wheel ..		5924
ditto Barring Wheel,		5923.

OIL SEPARATOR ON EDUCTION PIPE.

Vertical and Cylindrical. Made by -

Baker Oil Separator Co. Ltd, Leeds.

Diameter	...	3 Ft - 6 Ins.
Length	...	5 Ft.
Capacity	...	6000 lbs of steam per hour.
Diameter, Steam & Exhaust Openings,		10 Ins.

OIL PUMP FOR OIL SEPARATOR.

Made by - Baker Oil Separator

Co. Ltd., Leeds.

Diameter, Plunger	...	1 $\frac{3}{4}$ Ins.
Stroke do	...	3 $\frac{1}{2}$ Ins.
Size of Pump	...	"A"

OIL TANK FOR OIL SEPARATOR.

SIZE - 2 Ft - 9 Ins X 1 Ft - 9" X 2 Ft - 6 Ins.

STEAM REHEATERS 2

REHEATER BETWEEN H.P. & I.P. CYLINDER.

Number of M.S. Tubes	...	54
Bore of Tubes	...	1 In.
External Diameter, Tubes	...	1 ⁵ / ₁₆ In.
Length	do ...	5 Ft - 8 ³ / ₄ Ins.
Heating Surface	...	101.1
Diameter, Reheater over Flanges		2 Ft - 3 ¹ / ₂ Ins.

Reheater between I.P. and L.P.
is identical in every respect
with regard to size and heating
surface as the one between H.P.
and I.P. Cylinders.

AIR COMPRESSOR.

Single-Stage Type. Made by -
The Westinghouse Brake Co. Ltd.
London. Class, "F". Size 6/5.

Steam Inlet	...	Iron Pipe,	$\frac{3}{4}$ In.
Exhaust Outlet	...	do	1 In.
Air Delivery	...	do	$\frac{3}{4}$ In.
Maker's number on Compressor,			53838.
London Work's Number.	...		19254.

AIR CHARGER ON AIR VESSEL.

Wipperman & Lewis Type - made by
Frank Pearn & Co., Manchester.

Size "C" -

Delivery Pipe, dia.	$\frac{3}{4}$ Inch.
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MAIN BRAKE ON STEAM RANGE.

Diameter, M.B. Piston	...	3	Ins.
Ext. " M.B. Spring	...	5 $\frac{3}{8}$	Ins.
Int. " ditto	...	3 $\frac{3}{8}$	Ins.
Free length of Spring	...	26 $\frac{5}{8}$	Ins.
Spring, 12 Ins long when loaded with,		776	Lbs.
do 9 " ditto		935	Lbs.

STEAM BOILERS 3

"Lancashire" type - made by
Galloways Ltd, Manchester.

Maker's No. No. 1. 13320.
No. 2. 13321.
No. 3. 13322

Diameter	...	...	8 Ft 3 Ins to
			8 Ft 0 Ins.
Length	...	...	30 Feet.
Thickness, Shell Plates	...	...	$\frac{3}{4}$ In.
" End Plates	...	...	$\frac{3}{4}$ In.
Diameter, Internal Flues (Front End)			3 Ft - 2 Ins.
" ditto (Back End)			2 Ft - 8 Ins.
Thickness of Flues -			
Front End Section	...	...	$\frac{5}{8}$ In.
Intermediate "	...	...	$\frac{9}{16}$ In.
Back End "	...	...	$\frac{5}{8}$ In.
Manhole (McNeil type)	...	...	16 In X 12 Ins.
Steam pressure per square inch .			160 Lbs.
Total Heating Surface	...	...	1068 Sq. Ft.

MOUNTINGS ON EACH BOILER.

All of Hopkinson's make and
Specification "B. 1909".

MOUNTINGS (Continued)

One Figure 1004, patent Triad Junction
 Valve with Platnam Metal Valve & Seat, 7 In. dia.

One Anti-Priming Pipe ... Fig. 9058.

One Figure 7 Patent "Duad" Safety Valve
 for High Steam and Low Water, Class "B"

One Figure 10 Patent "Ipsed" Safety Valve, 2½ Ins dia

One Figure 2540 Bronze Blow off Valve
 with patent "Oplok" Pinion, with
 Box Key, Figure 6223 ... 2½ Ins "

Two "Absolute" Water Gauges, Figure
 6440, Class "B" ... ¾ In. "

Centre, Top and Bottom Arms of Gauges, 18 In "

One G.M. Water Level Pointer ... Fig.
 6250.

One Figure 4180 Open Faced Dial Steam
 Gauge 10 In. "

One Figure 1381 "Accessible" Check Feed
 Valve 2½ In. "

Fusible Plugs in each Boiler ... 2

One Figure 4180 Asbestos packed Cock and
 Syphon for Steam Gauge.

SUPERHEATERS TO BOILERS ... 3.

Made by - T. Sugden Ltd, London.

Tubes, Solid Drawn "U" shaped

Steel Tubes.

Diameter, Tubes (outside) ... 1½ Ins.
 No. Tubes to each Superheater . 40
 Diameter Steam Inlet and Outlet 7 ins.
 14

FITTINGS TO SUPERHEATERS

Spring loaded Safety Valve, 1½ In.
diameter, of Hopkinson's make.

Figure - 640.

One Wrought Steel Thermometer Pocket.
One Special Solid Glass Thermometer,
to read up to 600 degrees, Fahr.

FEED WATER PUMPS 2

Made by Lee, Howl & Co, Tipton.

"Tipton" Vertical type.

Maker's Numbers on Pumps

5784 - 5785.

Diameter, Steam Cylinders, ...	4½	Ins.
" Water Pistons ...	3	Ins.
Stroke of Pumps ...	12	Ins.
Capacity, in gallons per hour ..	550	
Diameter, Suction ...	1½	Ins.
" Delivery ...	1½	Ins.
" Steam Inlet to Pumps.	¾	Ins.
" Exhaust Outlet from Pumps,	1	In.

PACKINGS ON PISTON RODS.

Made by - The United States Metallic
Packing Company.

Maker's No. on Packings, 85081 & 85082.

FEED WATER TANK (CAST IRON)

5 Ft - 8 Ins X 3 Ft - 6 Ins X 4 Ft - 0 Ins.

Feed Water Heater of the Berryman type
is fixed inside tank for the Exhaust Steam
from Feed Pumps to pass through to waste.
Heater made by - J. Wright & Co, Tipton.

BALL VALVE FOR FEED WATER TANK.

Made by Messrs Glenfield & Kennedy.

Pattern - H.2.

Diameter	...	...	1½	Ins.
Diameter of Ball		...	12	Ins.

VALVES ON STEAM RANGE IN ENGINE HOUSE

Hopkinson's Ferranti Stop Valve,				
Figure 2025, without gear			5	Ins dia.
ditto with gear.				
Governor Valve.			5	Ins "
Throttle Valve operated by Main)				
Brake-)			5	Ins "

VALVES ON STEAM RANGE IN BOILER HOUSE.

Hopkinson's "Ferranti" Stop Valve,				
Figure 2025 with Spur Gear,			7	Ins dia.

AUTOMATIC C.O.² RECORDER.

Made by - Auto-Recorder Company,
Leicester. Model "A".

LUBRICATORS

Made by - Hunt & Mitton.

'Spring Top Lubricators on Engine Guides,			2	Ins. dia.
ditto	Crank Pins		2½	" "
ditto	Main Bearings		3½	" "

FEED WELL LUBRICATOR ON ENGINE.

Made by - The Empire Engineering Co. Ltd.

2 Feed Type.

<u>Glasses</u>	...	1½	In. diameter X 3½	Ins long.
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LUBRICATORS ON FEED PUMPS

Two $\frac{1}{3}$ Pint of the "Victor" Sight Feed
Type. Made by - C. Winn & Co, Birmingham.
Maker's Number on Lubricators, 3374 & 3375.

LUBRICATOR ON ELECTRIC LIGHT ENGINE

One As above. Maker's Number, 3282.

VENTURI RECORDER.

Made by - G. Kent Ltd, London.

Diameter, Water Meter Tube ... 18 Ins.
(Fitted with "A" type combined
Diagram and Counter Recorder).
Minimum Registration per hour ... 7860 Gallons.
Maximum ditto ... 110000 do
Our Order Number, dated 13/10/19. 554.

Extension of Steam Range in Boiler House.

Stop Valves installed with second Engine.

5 Hopkinson-Ferranti Patent Stop Valve
fitted with spur gear. Bore 8". Figure No. 2029.

4 Hopkinson-Ferranti Patent Stop Valve
fitted with spur gear. Bore 6" Figure No. 2029.

Steam Recorder.

One 10" Bristol Recording gauge on No. 1 Engine.
Chart No. 10,000.

MAPLE BROOK P.S. (NO. 1. ENGINE)PARTICULARS OF SPRINGS, RELIEF VALVE ON MAIN.

Number, Coils	...	18
Diameter, External	....	5 Ins.
" Section of Wire		43/64 Ins.
Length, Coil between centres when free)		1 Ft - 9 ²⁹ /32 In.
" ditto when loaded with 876 Lbs ...		2 Ft - 2 ¹ / ₄ Ins.

RUNWAY FOR WORKSHOP.

Made by - H. Morriss Ltd, Loughbrough.

1 H.M.B. Travelling Trolley to
carry $\frac{1}{2}$ ton.

Tested to $\frac{3}{4}$ Ton. Travelling
Wheels ungeared.

Section, Steel Joist	...	10 Ins X 5 Ins.
Price of each	... ..	£ 3. 9. 0.
Extra for Ball Bearings for Trolley)		3. 0. 0.
		<hr/>
		£ 6. 9. 0.
		<hr/> <hr/>

H.M.B. Pulley Blocks (Spur gear)		
to lift on quick gear	...	$\frac{1}{2}$ Ton.
Tested to	... ..	$\frac{3}{4}$ Ton.
Overall from Hook to Hook when fully expanded	...	10 Ft - 3 Ins.
ditto when closed up	...	1 Ft - 2 ¹ / ₂ Ins.
Clear lift obtained	...	9 Ft - 0 ¹ / ₂ Ins.
Length from Top Hook (1) to loop of Hand Chain	... ..	9 Ft - 3 Ins.
Price of each (Accepted 26.8.14)		£ 4. 6. 5.
Extra price for Ball Bearings		10. 0.
		<hr/>
		£ 4.16. 5.
		<hr/> <hr/>

NOTE:-

There are two temporary Borehole Buckets $15\frac{1}{2}$ Inches diameter, and Two temporary Borehole Clacks $14\frac{3}{4}$ Inches diameter at this Pumping Station.

OFFICIAL TRIAL. NO. 1. ENGINE

12th NOVEMBER, 1915.

Duration of Trial	...	6 hours
Duty per 1120 lbs of Steam. (Slip neglected)		165,604,341, ft.lbs
Average I.H.P. throughout trial,		241.703
" P.H.P. ditto		224.84
Gross Mechanical Efficiency .		93.02 %
Nett ditto	...	88.37 %
Duty of Engine (Guaranteed by Contractors)		165,000,000
Height of Pumping Pressure Gauge) from E.H.F.	)	5.66 Feet.

PARTICULARS OF "H.K. BEALE" ENGINE.

Number of Boreholes.	3 and 4.
Distance apart.	36 ft. 6 ins.
No.3 Borehole 36" dia. to a depth of	122' 3" from E.H.F.
" " 33" " " further depth of	321' 10" "
" " 20" " " " "	642' 3" "
No.4 Borehole 36" dia. to a depth of	121' 0" from E.H.F.
" " 33" " " further depth of	321' 8" "
" " 20" " " " "	633' 5" "

Both Boreholes are lined with mild steel tubes to the full depth of the 33" dia.

Top portion of lining tubes.	33" int. dia.
Bottom " "	30½" "

Cast iron lining tubes for suspending Rising mains concreted round Boreholes to a depth of	41 ft. from E.H.F.
Inside diameter of Castings.	3' 0"
Thickness of Metal.	1½"
Top of Boreholes from E.H.F.	17' 0"
Distance of ground line from E.H.F.	6' 0"

TYPE OF ENGINE.

Inverted Triple Expansion Surface Condensing Rotative pumping Engine with flywheels at each end of Engine.

Engine capacity.

Nett quantity per 24 hours at 20 revs. per minute. 2,000,000 gallons.

Specified Head.

Maximum Lift in Boreholes.	300 feet.
Ordinary working lift.	230 feet.

Head on delivery main (including friction)	282 feet.
Total specified head.	582 "

Pump Horse Power at 20 revs.	245.
Speed per minute.	20 revs.

RISING MAIN OF BOREHOLES 3 & 4.

Inside diameter of mild steel tubing.	16"
Length of each flanged tube.	15' 0"
Thickness of 1st 9 lengths.	$\frac{5}{8}$ "
" " 2nd "	$\frac{1}{2}$ "
Diameter of flanges of Tubes.	23 $\frac{1}{2}$ "
Thickness " "	2"

Each rising main consists of 18 tubes with flanges secured with 12 bolts 1 $\frac{1}{2}$ " dia. in each flange and with Vislok Nuts No.1.

TEMPORARY WORKING BARRELS IN EACH RISING MAIN.

Metal	Cast Iron,
Diameter of barrels.	15 $\frac{1}{2}$ "
Length "	9' 3 $\frac{1}{2}$ "
Flanges.	23 $\frac{1}{2}$ " dia.

PERMANENT WORKING BARRELS.

Diameter of barrels.	15"
Length "	8' 0"
Flanges.	23 $\frac{1}{2}$ " dia.
Thickness of Barrel.	1 $\frac{1}{2}$ "
Thickness of flanges.	3"

SUCTION VALVE BOXES. (CAST IRON)

Diameter of Narrow Part.	15"
Length of valve box.	5' 9"
Thickness of Metal.	1 $\frac{1}{2}$ "
Top flange of suction valve box.	23 $\frac{1}{2}$ "
Bottom " " "	20 $\frac{3}{4}$ "

Diameter of exhaust Inlet.	10"
Diameter of exhaust Outlet.	6"

TYPE OF AIR PUMP.

Single-acting vertical pump driven by levers from the I.P. Crosshead of the main engine.

Diameter of Air Pump.	18 $\frac{1}{2}$ "
Strokes of Air Pump.	2' 6"
Diameter of Pump Rod.	2 $\frac{3}{8}$ "
Type of Valves.	Dermatine.
Number of valves on head valve.	5.
Number of valves on bucket valve.	5.
Number of valves on foot valve.	5.
Diameter of dermatine valves.	6"
Thickness of Dermatine Valves.	$\frac{5}{8}$ "
Diameter of Inlet.	7"
Diameter of Outlet.	6"

STEAM CYLINDERS.

Diameter of H.P. Cylinder.	22"
Diameter of I.P. "	35"
" " L.P. "	55"
Stroke of Engine.	4' 0"
Type of Piston rings.	Buckley's No.2
Diameter of all Piston rods.	5"
Piston rod packings.	Metallic.
Maker's name.	The United States Metallic Packing Co., Bradford.
Maker's number on the H.P. rod.	209411
" " " I.P. "	209412
" " " L.P. "	209413

The steam cylinders are not jacketted.

TYPE OF ENGINE VALVE GEAR.

Corliss Gear of the "Dobson" design actuated from crankshaft by eccentrics and rods and with trip gear with noiseless dashpots.

PACKING OF VALVE SPINDLES.

Maker's name.

The United States Metallic
Packing Co., Bradford

Maker's number on Packings.

H.P. Top steam.	87296
H.P. bottom steam.	87297
H.P. top exhaust	87298
H.P. bottom exhaust.	87299
I.P. top steam	87300
I.P. bottom steam.	87301
I.P. top exhaust	87302
I.P. bottom exhaust.	87303
L.P. top steam.	87304
L.P. bottom steam.	87305
L.P. top exhaust.	87306
L.P. bottom exhaust.	87307

Diameter of connecting rod crank pins.	12"
Diameter of connecting rod crosshead pins.	8"
Diameter of crank shaft.	13"

FLYWHEELS. (CAST IRON.)Made in halves.

Diameter of Flywheels.	14' 0"
Width of rim.	14"
Internal diameter of boss.	17½"

TYPE OF DELIVERY AIR VESSEL.

Mild steel.

OIL RECOVERY TANK.

Size. 2' 0" x 15" x 18"
 Deep to overflow level.

STEAM REHEATERS.

Number of Reheaters. 2.
 Number of M.S.Tubes in one Reheater. 27.
 Type of M.S.Tubes. "U" Type.
 Bore of Tubes. 1"
 External diameter of Tubes. 1 5/16"
 Heating surface in one Reheater. 101 sq. ft.
 Diameter of Reheater over flanges. 2' 3 1/2"
 One Hopkinson "U" syphon for 7" gauge on each Reheater. Fig. No. 4199

AIR COMPRESSOR.

Type. 3 stage.
 Maker's name. The Westinghouse Brake Co., London.
 Size. 6 1/2" / 12"
 Steam Inlet. 1" iron pipe.
 Exhaust outlet. 1 1/2" iron pipe.
 Air Delivery. 1" iron pipe.
 Maker's number on Compressor. 57878
 Made in London Works, Number 21378

AIR CHARGER ON AIR VESSEL.

Type. Wippenman & Lewis.
 Maker's name. Frank Pearn & Co., West Gorton, Manchester.
 Size. "C"
 Delivery pipe. 3/4"

MAIN BRAKE ON STEAM RANGE.

Diameter of Brake Piston. 3"

Outside diameter of brake spring.	5 $\frac{3}{8}$ "
Inside diameter of brake spring.	3 $\frac{3}{8}$ "
Section of spring.	1" x 9/32"
Number of Coils.	28.
Spring 12" long when loaded with	776 lbs.
Spring 9" long when loaded with	935 "

LUBRICATORS.

One 6" Feed Patent "Feedwell" Lubricator.

One 4 Feed Patent Feedwell. "

Maker's name.

The Empire Engineering
Co., Salford.

Glasses.

VENTURI METER TUBE & RECORDER.

Maker's name.

G. Kent Ltd.,
London.

Diameter of Venturi Water Meter Tube
fitted with "A" Type combined
diagram and counter Recorder.

18"

Minimum registration per hour.

7860 gallons.

Maximum " " "

110000 "

Friction head at maximum of

3.9 feet.

Throat Ratio.

1 to 13 $\frac{3}{4}$

Maker's number on Venturi Recorder.

1629

Our order number dated 13th October, 1919.

554 M.D.

Quoted price £405. Amended price £431.0.0.

WEEKLY RECORDING DEPTH GAUGE.

Maker's name.

Glenfield &
Kennedy Ltd.,
Kilmarnock.

For Borehole depth of

315 feet.

STEAM RECORDER.

One 10 inch Bristol Recording Gauge for H.K. Beale Engine.

Chart No. 10000.

ELECTRIC LIGHT INSTALLATION. STATEMENT.

	£.	s.	d.
Original Cost of Electric Light Engine and dynamo and switchboard transferred to Trent Valley Pumping Station.	127.	7.	10.
Cost of Wiring Station for No.1 Engine including switches and Lamps &c.	147.	16.	7.
Cost of Wiring for H.K.Beale Engine Smith & Bellhouse's quotation.	93.	12.	6.
Cost of One double crank Vertical totally enclosed single-acting engine 4" cylinders by 4" stroke to develop 8 B.H.P. and 700 revs. per minute, complete with 5 K.W. compound wound generator of the Electric Construction Company's make for 100 amps at 50 volts.	183.	12.	0.
One Switchboard complete.	30.	17.	0.
	£ 583.	5.	11.
Less Cost of Original Engine & Dynamo with switchboard sent to Trent Valley.	£ 127.	7.	10.
	£ 455.	18.	1.

Maker's name of Electric Light Engine.	Bumsted & Chandler Hednesford.
Maker's Number on Engine.	Silent Engine No. 4 No. 2081.
Maker's number on Dynamo.	55304.
Maker's name on Switchboard.	Messrs. Munder.
Date of order for above.	3rd December, 1923.

PARTICULARS ON NAME PLATE OF DYNAMO.

Electric Construction Co. Ltd., Wolverhampton.
D.C. Dynamo No. 55304.
5 K.W. 50 volts. 100 amps.
700 r.p.m. Rating Continuous.