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R. E. Bullock Pump

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Centrifugal pumps driven by oil engines and electric motors are undoubtedly about the most efficient means available for lifting water for irrigation and are fast becoming indispensable items in the equipments of most farms. Nevertheless these still remain out of the reach of several thousands of small farmers owning or cultivating only a few acres because their cost in terms of the financial resources of such farmers continues to be prohibitive. Irrespective of whether a farmer employs lift irrigation or not he has to necessarily maintain a few bullocks to do his ploughing and carting. It is seldom if ever that work can be found on a farm for these animals all the year round. Hence if a cheap and fairly efficient water lift which could be operated by a pair of bullock could be devised it was felt that many small farmers would consider its welcome addition to their equipment. It was with the object of providing such a water lift that the design of the bullock pump was undertaken in June '53 at the instance of the Director of Agricultural, Madras. The first successful model of the bullock pump suitable for use in open wells was manufactured and tested successfully at the Central Farm, Agricultural College, Coimbatore towards the end of 1953. In early 1954, a second model of the pump suitable for use in a tube well was also manufactured and tested.

The open well model of the bullock pump consists of two six inch pipes let down vertically into the well and clamped side by side, about 3 ft. apart to a wooden beam placed across the mouth of the well at ground level. The bottom ends of the two pipes extend a few feet below water level, and the top ends project 6′ above ground level. The lengths of these two pipes which form the pump barrels will therefore depend on the depth of water level below ground level. A delivery spout consists of a 3″ dia. pipe welded on to each of the barrels 2′ below the top. A flap valve opening upwards manufactured out of a standard 6″ coupling is fitted at the bottom of each of the two barrels. Two C. I. cylindrical plungers $5\frac{7}{8}$″ in dia., 12″ long with a central bore of $2\frac{1}{2}$″ dia., and each weighing 50 to 60 lb., work inside these pump barrels. The top of the central bore in each plunger is closed with a flap valve opening upwards. A standard leather pump bucket is fitted to the bottom of each

plunger for providing necessary seating between the plunger and the barrel. The plungers have a stroke of 9' extending from the water level upwards. The plungers are operated by means of two 3/8" wire ropes. One end of each of these ropes is attached to a plunger. The ropes are then brought up through the pump barrels and over two pulleys carried on two brackets fixed to the tops of the two barrels.

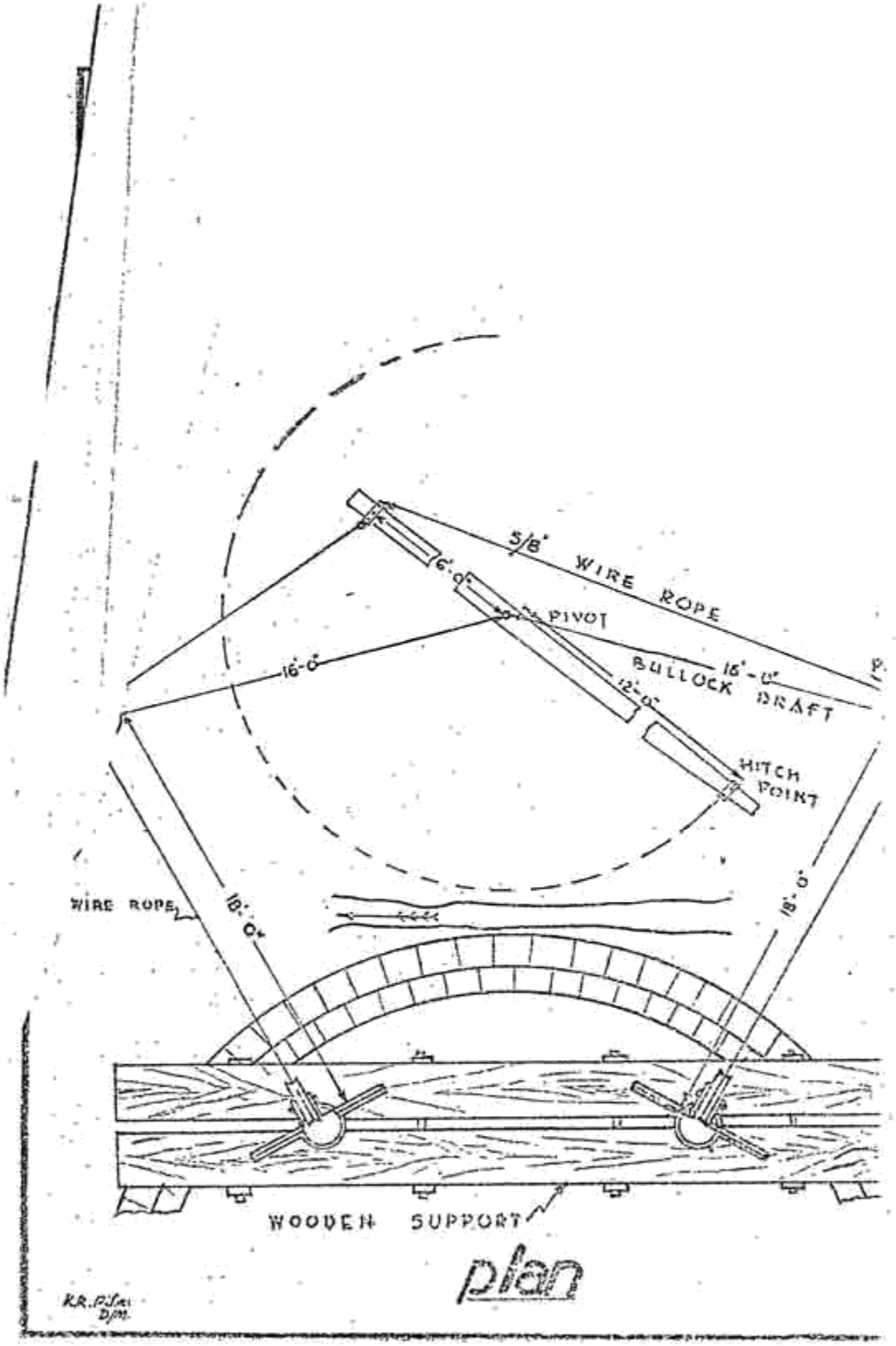
The wire ropes then diverge horizontally to pass through two pulleys mounted on two posts situated diametrically opposite each other on the edge of a bullock track. The height of the pulleys on the post are so adjusted that the wire ropes are horizontal. After passing through these pulleys the 2 wires are brought together to a common terminal through a swivelling block on a rotating beam at a distance of 4½' from the centre of rotation.

The rotating beam is mounted on a central pivot post fixed rigidly to the ground in a concrete foundation at the centre of the bullock track. A pair of bullocks is hitched to the free end of the rotating beam at a distance of about 12' from the centre of rotation.

When the bullocks go round the track, the central beam rotates and the plungers move up and down the barrels one plunger ascending and lifting the water while the other descends. Each barrel discharges once during each rotation of the beam. A pair of average bullocks can go round the track at 2½ to 3 times per minute without undue strain.

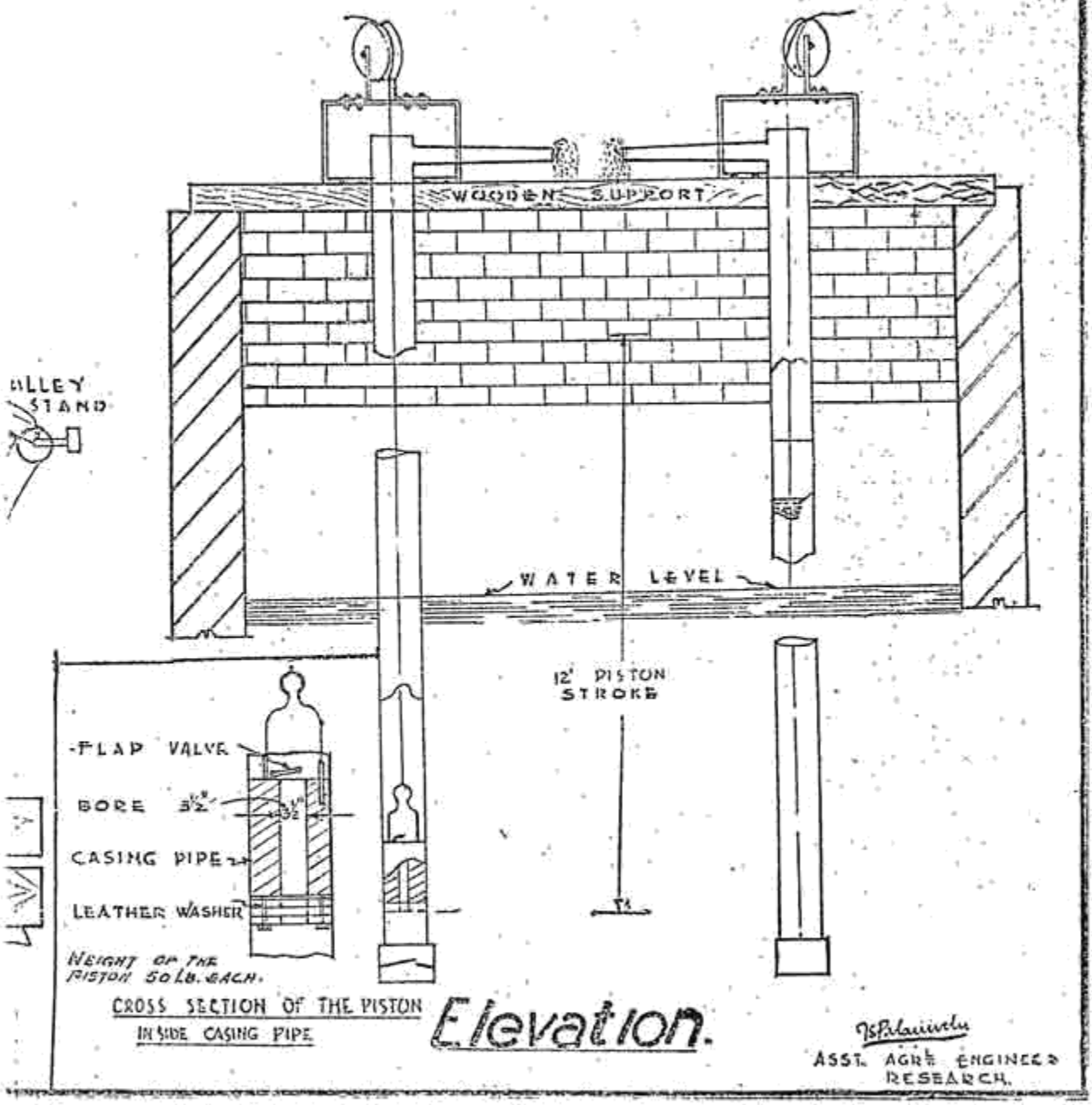
During the preliminary trials conducted with this pump at the Central Farm, Agricultural College, Coimbatore, an output of 2700 gallons per hour against a total head of 20' was obtained. Under identical conditions the output of double bullock mhote is only, 2000 gallons per hour.

The tube well model of this pump is very similar to the open well model, the points of difference being continued to the pump barrels alone. Each barrel in this case consists of a standard 3" tube well filter point installed below ground level at a depth where a coarse sand medium bearing sufficient water is available. The filter point is connected to a 3" pipe which extends up to 9 ft. below ground level. At this level, a check valve manufactured from two standard 3" couplings welded together is interposed. The pump barrels consisting of a 5" pipe is screwed on to the top of the check


5/8" WIRE ROPE
6'-0"
PIVOT
16'-0"
BULLOCK DRAFT
12'-0"
HITCH POINT
WIRE ROPE
18'-0"
18'-0"
WOODEN SUPPORT
plan

R.E. BULLOCK PUMP.

open well model.



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valve. The plungers in this case have a stroke of 12 feet extending from the bottom of the barrel upwards. To obtain this stroke the common terminal for the wire rope on the rotating beam is fixed 6 ft. from the centre of rotation. The two pump barrels are spaced about 10 feet apart.

A bullock pump of the tube well model has already been erected at the Agricultural Research Station, Aduthuri in Tanjore district and one of the open well model at the Central Farm, Agricultural College, Coimbatore. Another unit of the open well type is shortly to be erected at the Coconut Research Station, Pilicode in South Kanara district. Drawings and estimates for both the types are given below:

Estimate for the Manufacture of one R. E. Bullock Pump Open-Well model suitable for a total lift of 20'

S. No.	Particulars of Materials	Quantity	Rate Unit	Amount
			Rs. A. P.	Rs. A. P.
1	6" W. I. Pipes ..	50'	5 0 0 per ft.	250 0 0
2	2" W. I. ,, ..	6'	1 2 0 ,,	6 12 0
3	2" W. I. Coupling ..	2 Nos.	1 0 0 each	2 0 0
4	6" W. I. Coupling ..	4 ,,	10 0 0 ,,	40 0 0
5	C. I. Plungers (Rough Casting) ..	2 ,,	26 0 0 ,,	52 0 0
6	2" × 2" M. S. Bar for Central Pivot ..	5'	1 8 0 per ft.	7 8 0
7	4" Pulley with sleeve ..	2 Nos.	7 0 0 each	14 0 0
8	8" Pulley with ball bearings ..	2 Nos.	15 0 0 ,,	30 0 0
9	1" × 1" M. S. Bar for pulley frame ..	20'	0 12 0 per ft.	15 0 0
10	2" × ¼" M. S. Flats for swivelling block ..	2'	1 0 0 ,,	2 0 0
11	5/8" M. S. rod ..	12'	0 3 0 per ft.	2 4 0
12	3/8" Wire rope ..	80'	0 6 0 ,,	30 0 0
13	T. W. Beam for supporting pump barrels 16' × 8" × 4" ..	2 Nos.	15 0 0 each	30 0 0
14	Wooden posts 8' long ..	2 Nos.	5 0 0 each	10 0 0
15	T. W. Poles 18' long for rotating beam ..	1 No.	15 0 0 each	15 0 0
16	Bolts and nuts, leather for flap valves, concrete for foundation etc. ..			35 0 0
17	Labour charges ..			100 0 0
18	Contingencies ..			33 8 0
				675 0 0

Estimate for Manufacture of 1 R. E. Bullock Pump—Tube Well—Model Suitable for a Total Lift of 20′

S. No.	Particulars of Materials	Quantity	Rate Unit	Amount
			Rs. A. P.	Rs. A. P.
1	3″ Tube well filter points ..	2 Nos.	115 0 0 each	230 0 0
2	3″ W. I. Pipes ..	15′	2 8 0 per ft.	37 8 0
3	3″ W. I. Coupling ..	8 Nos.	1 12 0 each	14 0 0
4	5″ W. I. Pipes ..	28 Nos.	4 12 0 per ft.	133 0 0
5	3″ W. I. Bends ..	2 Nos.	12 0 0 each	24 0 0
6	C. I. Plungers (Rough costing) ..	2 Nos.	26 0 0 each	52 0 0
7	2″ × 2″ M. S. Bar for Central Pivot ..	5′	1 8 0 per ft.	7 8 0
8	4′ Pulley with sheave ..	2 Nos.	7 0 0 each	14 0 0
9	4″ Pulley with ball bearing ..	2 Nos.	15 0 0 each	30 0 0
10	1″ × 1″ M. S. Bar for pulley frame ..	20′	0 12 0 per ft.	15 0 0
11	2″ × $\frac{1}{2}$ M. S. Flat for swivelling block ..	2′	1 0 0 per ft.	2 0 0
12	$\frac{5}{8}$″ M. S. Rod ..	12′	0 3 0 per ft.	2 4 0
13	$\frac{3}{8}$″ Wire rope ..	80′	0 6 0 per ft.	30 0 0
14	Wooden posts 8′ long ..	2 Nos.	5 0 0 each	10 0 0
15	T. W. Poles 13′ long for rotating beam ..	1 No.	15 0 0 each	15 0 0
16	Bolts and nuts, leather for flap valves, concrete for foundation			35 0 0
17	Labour charges ..			10 0 0
18	Contingencies ..			23 12 0
				775 0 0

ON LORD RUTHERFORD

"He broke the indivisible
Made plain the invisible
Changed the immutable
And unscrewed the inscrutable".

(Stephen Miall).