NOTES ON THE EXHIBIT OF ROAD TRANSPORT VEHICLES AND OTHER PLANT, AT THE NORTH-WESTERN RAILWAY POWER STATION, AT MOGHALPURA, 8TH APRIL 1922.

BY W. S. DORMAN, M. INST. C. E.

EXHIBITS.

Bombay Cycle and Motor Agency, Ltd., Lahore.

25 H. P., 3½-ton, 4 cylinder, De Dion-Bouton Motor Truck Chassis, fitted with 36″×5″ single solid tyres to front wheels and 36″×5″ twin solid tyres to rear wheels. Gear box, four speeds and reverse, direct drive on top gear, wheel base 13′ 5″, track 5′ 5½″, complete with tools, etc.

Price Rs. 15,500.

30-35 H. P. Dodge Brothers Truck with 1-ton Graham Brothers Body, with electric lights and self-starter, fitted with 32″×4″ Royal Cord tyres on front wheels and 34″×5″ Nobby Cord tyres on rear wheels, all pneumatic, with jack, pumps, tools and spare rim.

Price Rs. 7,750.

The Karachi Motor Car Co., Lahore.

35 H. P., 3½-ton, 4 cylinder, Fiat Lorry, fitted with single solid rubber tyres on front wheels and 900×120 mm. twin solid tyres on rear wheels, four speeds and reverse, over all length of chassis 18′ 2½″, wheel base 12′ 0″, track 5′ 5⅓″, complete with body, tools, etc.

Price Rs. 13,750.

3-ton Dyson Standard Trailer, complete with body.

Price Rs. 5,000.

Ford Automobiles (India), Ltd., Lahore.

20 H. P. 1-ton, 4 cylinder Ford Chassis, fitted with solid or pneumatic tyres, with demountable rims, wheel base 10′ 4″, worm gear drive, standard Ford engine and transmission, complete with tools, lamps and pump.

Price Rs. 3,850.

Fordson Tractor for ploughing, three speeds and reverse, total weight 2,700 lbs., with draw-bar pull of 2,500 lbs. in low gear and 1,800 lbs. in plough gear, complete with tools.

Price Rs. 4,600.

Oliver Two-Share Mould Board Plough, specially designed for use with a Fordson Tractor and adjustable to depths of from 2 to 8 inches.

Price Rs. 1,000.

P. W. D. Plant.

Clayton Steam Tractor with a 3-ton non-tipping trailer.

5-ton Foden Steam Wagon—Colonial Type. End tipping, with solid rubber tyres, with a 3-ton spring mounted trailer.

10-ton Marshall Compound Road Roller, converted into a Traction Engine, with two trailers.

An Austin Road Scarifier, with double-ended, adjustable, tynes and independent steering.

Price Rs. 3,250.

Little Western Steel Grader.

Cost about Rs. 2,650.

NOTES.

3½-Ton Fiat Lorry.

The 3½-ton Fiat Lorry carries 75 cubic feet of road metal itself, and draws 50 cubic feet in a trailer. Two of these lorries, after working on the Grand Trunk Road in the Sheikhupura District for some months, were transferred to the Rawalpindi Division, where they were employed from September to December in transporting road metal. The log kept by Mr. Macfarlane during these three months shows that, although one lorry was out of action for 5½ weeks and the other for a fortnight, yet between them they carried 23,000 cubic feet of metal, while travelling 5,291 miles—mostly over very bad roads ; and, excluding any expenditure incurred on repairs, the average cost of transporting this metal worked out to Re. 1·45 per 100 cubic feet per mile.

Mr. Macfarlane found that his petrol consumption over the period had averaged 4·56 miles, and his oil consumption 69·62 miles, to the gallon, while a pound of grease sufficed for 21·16 miles.

During one fortnight, in the Sheikhupura District, the rate of moving 4,850 cubic feet of metal a distance of approximately 3 miles, in one lorry over a good road, had been as high as Rs. 2·23 per 100 cubic feet per mile, while during another fortnight (12 working days) 5,750 cubic feet were moved a distance of from 5 to 7 miles, when the rate fell to Rs. 1·28 per 100 cubic feet per mile. In the first case the recorded petrol consumption was as much as 3 miles, and that of lubricating oil

81 miles, to the gallon (including the return journeys of the empty lorry), while in the second case the petrol consumption fell to 4·8 miles, and the lubricant to 139 miles to the gallon, as compared with the maker's estimate of 7·5 miles per gallon of petrol, and a gallon of oil sufficing for 120 miles.

Analysing and comparing the cost of transport on the Fatehjung-Khaur Road with the Grand Trunk Road the relative rates per hundred cubic feet are as follows :—

	Fatehjung-Khaur Road.	Grand Trunk Road.	
	Rs.	Rs.	Rs.
Petrol ...	·82	1·22	·77
Lubricants ...	·27	·19	·08
Labour on loading and unloading	·14	·55	·31
Lorry establishment— (Driver and cleaner)	·22	·27	·12
Total ...	1·45	2·23	1·28

The fact that petrol was Re. 1-14 a gallon, as compared with Re. 1-9 on the Fatehjung-Khaur Road, combined with the shortness of the lead, doubtless accounts for the high rate in the first set of figures for the Grand Trunk Road, but the average consumption was also greater. The relative costs of loading and unloading would also indicate much better arrangements or greater facilities in some cases than in others. Although the Fatehjung-Khaur Road was in an appalling state, a lorry used to do two round trips of 28 miles in the day, and has carried as many as five loads of metal in a day, to a place $4\frac{1}{2}$ miles from the quarry. The average lead was $9\frac{1}{2}$ miles. The Grand Trunk Road record has been six round trips of 11 miles apiece.

Mr. Macfarlane reports that his only machinery trouble has been the wearing out and breaking of the driving chains, and this he considers is partly owing to their not being sufficiently encased from dust and mud.

Although specially designed for mechanical haulage at high speed, the non-tipping Dyson Standard Trailer has the drawback that its fore-carriage only allows of its being pulled one way, and as it is impossible, on an ordinary road, for the Fiat to turn it round in a complete semi-circle (the minimum turning radius of the lorry alone is 21 feet 3 inches) it has to be uncoupled and turned by hand, before the lorry can start on the return journey.

Clayton Steam Tractor.

A Clayton Steam Tractor with two 3-ton, non-tipping, trailers were purchased last year, the estimated home prices being £ 1,430 for the tractor and £ 192 for each trailer. These have so far only been used for carrying sand in Lahore and bricks in Amritsar, the average load in the one case being 80 c. ft. of sand and in the other 900 bricks.

The following details have been supplied by Mr. Stubbs on the working of these tractors and trailers :—

	Lahore.	*Amritsar.*
Time taken to load the two trailers ...	30 minutes.	40 minutes.
Time taken to unload ...	15 ,,	15 ,,
Average lead ...	4 miles.	5 miles.
Quantity carried daily ...	480 c. ft.	7,200 bricks.
Number of trips made each day ...	3 trips.	4 trips.
Daily working expenses ...	Rs. 35-4-0	Rs. 34-13-0

On analysis, the Lahore rate works out as follows for carrying 100 c. ft. of sand a mile :—

	Rs.
Fuel	·90
Lubricants	·19
Loading and unloading ...	·60
Establishment (driver and fireman)	·15
Total cost per 100 c. ft. per mile...	1·84

and as the weight of sand is nearly the same as broken stone* this rate is comparable with the rates for moving stone.

In this case coal was costing Rs. 35 a ton, and both cylinder and engine oil Rs. 2-8 a gallon.

Foden Steam Wagon.

A 5-ton Foden, Colonial Type, Tipping Wagon, with screw end, and solid rubber tyres, cost £ 1,495 at home, complete with its outfit of tools and accessories, while a 3-ton spring-mounted trailer cost £ 360. Actually delivered and erected in Lahore a wagon with its trailer cost Rs. 18,900.

*A hundred cubic feet of Taraki stone metal weigh 4·4 tons and Ravi sand 4·15 tons.

Two of these wagons have been working in and around Lahore for the past nine months, and the following figures are all based on a stone metal carrying capacity of 130 c. ft. with 97 c. ft. in the trailer.

An analysis of the cost of a full fortnight's work, taken at random from the log maintained, shews that one week the cost of carrying 3,750 c. ft. of stone metal, $2\frac{3}{4}$ miles, worked out to Rs. 2·23 per 100 c. ft. per mile, while the following week the rate for moving 3,632 c.ft. $4\frac{1}{8}$ miles was only Rs. 1·85 per 100 c. ft. per mile.

Further analysis shewed the rates were made up as follows :—

	First week.	*Second week.*	*Average.*
	Rs.	Rs.	Rs.
Fuel ...	1·05	·80	·92
Lubricants ...	·44	·35	·40
Loading and unloading ...	·55	·56	·55
Establishment (driver and fireman)	·19	·15	·17
Total ...	2·23	1·86	2·04

A steam wagon such as the Foden is, however, obviously at a disadvantage as compared with a petrol lorry, since it has to remain under steam while being loaded ; and some observations were made to ascertain how many hours useful work a Foden steam wagon did in a day.

The following figures are instructive as having been recorded under normal working conditions :—

Time taken to load a wagon ...	60 minutes.
Time taken to load a trailer ...	45 minutes.
Time taken to tip a wagon ...	5 minutes.
Time taken to unload a trailer ...	30 minutes.
Time spent on the road in transporting the metal 4 miles ...	38 minutes.
Time taken over the return journey	31 minutes.

A complete cycle thus occupied $3\frac{1}{2}$ hours, so that only two journeys were made in a day, and to carry 454 c. ft. of metal cost Rs. 35-4.

This rate analyses as follows :—

	Rs.
Fuel	·80
Lubricants	·36
Loading and unloading ...	·55
Establishment (driver, fireman, and cleaner)	·23
Total cost per 100 c. ft. per mile ...	1·94

Working to a eight hours day, the wagon could have carried the metal 6 miles instead of 4, with very little additional fuel, and no increase in labour or establishment charges, and in this case the cost per hundred cubic feet per mile would have been Rs. 1·3.

Had the wagon been running without its trailer it would have taken two hours for the round trip, and would probably have made four trips in the day for the same fuel consumption and labour charges. It would then have carried 520 c. ft. of metal for Rs. 35-4 and the rate would analyse as follows :—

	Rs.
Fuel	·70
Lubricants	·32
Labour in loading and unloading ...	·48
Establishment as before	·20
Total cost per 100 c. ft. per mile ...	1·70

Thus, taking the mere working costs into consideration, it would seem to be more economical to run the lorry alone, over short distances, than to wait for the trailer to be loaded.

Working with the trailer over 4 miles, which is a fair average lead on the Grand Trunk Road, it will be noticed that for every hour the wagon is running it is standing idle for two, so that it should be possible to double the output by providing adequate facilities for loading through a shoot from a raised platform, with the trailer made to tip, or even a second trailer attached to each wagon, which could be left behind to be unloaded at leisure, while the wagon returned for a fresh load with the already emptied trailer of the previous trip. Matters could be improved even without ideal loading facilities by providing a third trailer for each wagon, so that while one was loading, and the second in transit with the wagon, the third would be unloading.

The time lost in loading by means of baskets, metal off the ground, is, however, a heavy handicap to the efficiency of any lorry, and to get full value from these comparatively costly machines, it is essential to provide proper loading facilities, either from a raised platform as indicated above, or by means of an elevator somewhat on the lines of the Austin Self-feeding Wagon Loader, or the Jeffrey Radial Loader, either of which would be capable of loading a 5-ton wagon in five minutes. Unfortunately a fairly heavy and continuous output, with more than one lorry working, is necessary to justify any heavy expenditure on loading facilities.

The cost of repairs, including tyre renewals, is a very variable item, and largely depends on the class of road over which the wagon is working, the driver's skill, and his care in avoiding overloading. In any case, however, standing charges, such as the interest on the money invested, depreciation, insurance, and repairs, should be taken into account in estimating the cost of carriage by motor transport, and taking average figures for these, for instance in connection with the Fatehjung-Khaur Road, it will be found that the actual cost of carrying 23,000 cubic feet in three months must be increased as follows :—

Present day cost of a Fiat Lorry with a Dyson Trailer is Rs. 18,750. Hence for three months, working with two lorries and two trailers :—

Interest and depreciation on	Rs. 37,500	at	15	per cent.	5,625
Insurance	,, ,,	at	1½	,,	563
Repairs (with tyres)	,, ,,	at	7½	,,	2,812
				Total Rs.	9,000 : 4
				= Rs.	2,250

or an addition of Rs. 1·03 per hundred cubic feet per mile, making the total rate Rs. 2·48 per mile.

Marshall Steam Tractor.

So far little opportunity has been found for using the 10-ton Marshall Compound Roller as a tractor, but Messrs. Marshall, Sons, & Co., Ltd., have kindly furnished the following particulars through their Lahore Branch :—

The 10-ton roller converts into a 5 H. P. traction engine, capable of hauling 20 tons along a level road at 1½ miles an hour. The tender carries 105 gallons of water, and, as the consumption is 50 gallons an hour, the engine has to water every

two hours. The coal consumption should not exceed 63 lbs. of good coal an hour, and as the tender carries 4½ cwt., the engine should work for 8 hours without coaling. Thus at fast speed (2·7 miles an hour) the engine has to water every 5½ miles and coal every 21 miles. The engine can turn in a circle of 30 feet outside diameter.

Working in the Ambala District, Mr. Cargill found that while each trailer could carry 100 cubic feet of boulders, a speed of more than 2 miles an hour caused excessive vibration. Cheap wood fuel was available (6 annas a maund) and the rate for carrying 1,000 cubic feet of boulders, an average distance of 4·8 miles, worked out as follows :—

	Rs.
Fuel	·47
Lubricants	·22
Loading and unloading ...	·43
Establishment (driver, fireman, and bhishtie)	·21
Total cost per 100 c. ft. per mile ...	1·33

Mr. Cargill found that while it took about an hour to load the two trailers, it took only 10—15 minutes to unload, and about 20 minutes to turn the tractor and trailers round and hitch up for the return journey.

The Fordson Tractor.

The Fordson tractor runs on kerosine oil, and coupled to an Oliver plough, is said to be able to plough an acre on a consumption of 2½—3 gallons of oil and three pints of lubricant. The actual petrol consumption of a Ford truck, running up and down the canal bank at Rasul, worked out to 18 miles to a gallon.

Road Grader.*

The Little Western Steel Grader is used to grade, smooth, and "crown" kachha roads. So far it has only been tried by Mr. Mitchell under bullock power, when the depth of the cut does not exceed three inches. It is advisable to use it when the soil is moist after rain, or where canal water is available. A dry soil is powdered, and requires subsequent watering and dragging.

* Some practical hints on the operation of Tractor Grading Outfits will be found on pages 800—802 of the Engineering News-Record for November 17, 1921.

HOLLOW WALLS.

By Major W. Garforth, M.C., D.S.O., R.E.

The writer's attention was drawn to an article on hollow walls which appeared in the "Scientific American," dated 9th of July 1921 (Appendix A attached).

2. It was then decided to construct hollow walls of various thicknesses and laid in cement, lime and mud mortars. These walls have been built in the grounds of No. 27 Bungalow, Gazetted Officers' Residences Estate, Lahore.

3. The tabular statement marked B shows the comparative cost of hollow and solid walls laid in cement, lime and mud mortars.

4. It is considered that a 9 inch hollow wall laid in cement can be advantageously used instead of the solid 13½ inch wall laid in mud in all cases, and the walls of out-houses (on the site referred to above), have been constructed in this way. The outer walls of these out-houses consist of 9 inch hollow walls laid in cement mortar, while the inner walls are 9 inch hollow walls laid in lime. It should be noted that it is necessary for the jambs of doors and windows and corners of walls to be of *solid* and not hollow construction.

5. The Sub-Divisional Officer in charge of the work states that after demonstrating the bond of these walls with dry bricks, the masons had no difficulty in carrying out the work.

6. It must be brought to notice that the walls so far constructed on this principle have been under 15 feet in height, but with higher walls, the problem of scaffolding will possibly offer difficulties. It remains to be seen, however, whether these difficulties can or cannot be easily surmounted.

7. Besides the advantage of using the 9 inch hollow wall referred to in paragraph 4 above, it is thought that the 15 inch hollow wall can be used in place of the ordinary 18 inch solid wall in mud. Some officers however contend that in spite of its cost being cheaper than the ordinary solid 18 inch wall laid in mud, they would prefer not to use 15 inch hollow wall laid in mud, owing to the fear of disintegration of the mud mortar due to possible leakage through the roof above. This view, however, is not universally accepted, and some contend that this risk might be accepted without fear of disaster. Nothing but experiment can prove which view is correct, and it would be well worth while

constructing a building with 15 inch hollow walls laid in mud mortar to observe whether this system could be universally adopted for all buildings as a substitute for the 18 inch solid wall laid in mud.

8. The whole object of using hollow instead of solid walls is economy, which in these days of financial stringency is, as all officers are well aware, most desirable.

(*N.B.*—Details of a 9 inch hollow brick wall are shown on the plate accompanying this note.

Detail of other thicknesses are on record with the Honorary Secretary, Punjab Engineering Congress.)

APPENDIX A.

Copied from the "Scientific American," dated 9th July 1921.

SOMETHING NEW IN BRICK WALLS USING STANDARD BRICKS.

Some two score building commissioners from leading cities of the country saw an interesting test of the new hollow brick wall, which is being promoted by the Common Brick Manufactures Association of America, at their recent conference in Cleveland. Practically all of them will recommend it for adoption under the building codes of their cities.

The wall can be built in any thickness and claim is made for it that by reason of breaking the continuous mortar joints that exist in solid brick walls it becomes impervious to the penetration of moisture. Plastering is done directly upon the inside veneer with complete freedom from detrimental moist effects whether the wall be 8, 12 or 16 inches.

In this wall the bricks are laid on edge with headers at every joint in an 8 inch wall, but at varying distances in the thicker walls. Builders say it offers a saving of one-third in brick, one-half in mortar and twenty-five per cent. in labour cost, in addition to saving the cost of furring for plastering when the wall is done. It has been used successfully in half a dozen States.

The Cleveland test was made with two walls of 8 inch thickness, 9 ft. high and 12 ft. long, paralleling each other at a distance of 12 ft. apart. A short return was built at each end. Four types of construction were provided.

Upon a heavy platform upon these walls was built a 12 inch hollow brick wall 4 ft. high, forming a complete inclosure. Into this was dumped sand which together with the platform and walls represented an aggregate weight in excess of 83 tons, the equivalent of the weight of an average two-story, seven-room house, or approximately three times the burden that would ordinarily be imposed upon them. Not the slightest evidence of stress appeared even under this most severe test.

The wall has never been adequately tested but such tests will be made shortly with the ten million ton machine of the Bureau of Standards at Pittsburgh. The Bureau at present is conducting fire tests.

B.—Statement showing cost of hollow and solid brickwork for 100 c.ft. of masonry.

Items.				18" hollow brick-work in cement.		18" hollow brick-work in lime.		18" solid brick-work in mud.		12" hollow brick-work in cement.		12" hollow brick-work in lime.		12" solid brick-work in mud.		9" hollow brick-work in cement.		9" hollow brick-work in lime.		9" solid brickwork in mud.		15" hollow brick-work in cement.		Remarks.
				Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	
MATERIALS.					Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.	
...	...	20 8 0	‰	1,500	30 12 0	1,500	30 12 0	2,025	41 8 3	1,029	21 1 6	1,029	21 1 6	1,506	30 14 0	804	16 8 0	804	16 8 0	1,600	20 8 0	1,172	24 10 6	
C. Sand. 1 : 6	...	0 14 0	c.ft.	22	19 4 0	...	...	...		14	12 4 0	...	...	..	..	8	7 0 0	...	...	..	...	21	18 6 0	
ne ...	...	0 5 0	c.ft.	..	..	22	6 14 0	...	...	...	...	14	4 6 0	...	...	...	...	8	2 8 0	...	...	...	...	
...	...	8 0 0	%	...	...	...	..	38	3 0 0	...	...	...	..	28	2 4 0	...	...	...	..	19	1 8 4	...	...	
Total cost	...	...	...	...	50 0 0	...	37 10 6	..	44 8 3	...	33 5 6	...	25 7 6	..	33 2 6	...	23 8 0	...	19 0 0	...	22 0 4	...	43 0 0	
LABOUR.																								
d coolies	...	...	...	...	18 2 11	.	18 2 11	...	12 0 0	...	17 4 0	...	17 4 0	...	9 0 0	...	7 8 0	...	7 8 0	...	6 0 0	...	10 7 0	
od materials	..	...	...	...	68 2 11	...	55 12 11	...	56 8 3	...	50 9 6	...	42 11 6	...	42 2 0	...	31 0 0	...	26 8 0	...	28 0 4	...	53 7 0	
r's profit	...	10 0 0	%	...	6 13 1	...	5 9 3	..	5 10 5	...	5 1 0	...	4 4 4	...	4 3 2	...	3 2 0	...	2 10 4	...	2 12 10	...	5 5 0	
Total cost	...	...		...	75 6 6	...	61 6 2	...	62 2 8	...	55 10 6	..	46 15 10	...	46 5 2	...	34 2 0	...	29 2 4	...	30 13 2	...	58 12 0	Say 59 0 0

B.—Statement showing cost of hollow and solid brickwork for 100 s.ft. of masonry.

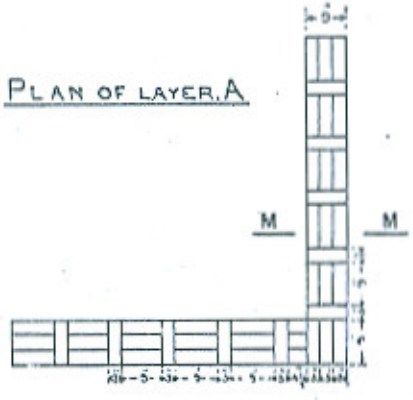
Items.			18" hollow brick-work in cement.		18" hollow brick-work in lime.		18" solid brick-work in mud.		12" hollow brick-work in cement.		12" hollow brick-work in lime.		13½" solid brick-work in mud.		9" hollow brick-work in cement.		9" hollow brick-work in lime.		9" solid brickwork in mud.		15" hollow brick-work in cement.		Remarks.
			Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	Quantity.	Amount.	
MATERIALS.				Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.		Rs. a. p.	
...	...	20 8 0	‰	1,500	30 12 0	1,500	30 12 0	2,025	41 8 3	1,029	21 1 6	1,029	21 1 6	1,500	30 14 0	804	16 8 0	804	16 8 0	1,000	20 8 0	1,172	24 10 0	
C. Sand. 1 : 6	...	0 14 0	c.ft.	22	19 4 6	...	...	...	...	14	12 4 0	...	...	...	..	8	7 0 6	...	...	...	...	21	18 6 0	
me ...	...	0 5 0	c.ft.	...	..	22	6 14 0	...	...	...	...	14	4 6 0	...	...	...	...	8	2 8 0	...	...	...	...	
...	...	8 0 0	%	...	...	...	...	38	3 0 0	...	...	...	..	25	2 4 0	...	...	...	...	19	1 8 4	...	...	
Total cost	...	...	...	...	50 0 0	...	37 10 6	...	44 8 3	...	33 5 6	...	25 7 6	..	33 2 6	...	23 8 0	...	19 0 0	...	22 0 4	...	43 0 0	
LABOUR.																								
ed coolies	...	...	...	..	18 2 11	..	18 2 11	...	12 0 0	...	17 4 0	...	17 4 0	..	9 0 0	...	7 5 0	...	7 8 0	...	6 0 0	...	10 7 0	
od materials	..	...	...	...	68 2 11	...	55 12 11	...	56 8 3	...	50 9 6	...	42 11 6	...	42 2 0	...	31 0 0	...	26 8 0	...	28 0 4	...	53 7 0	
r's profit	...	10 0 0	%	...	6 13 1	...	5 9 3	..	5 10 5	...	5 1 0	...	4 4 4	...	4 3 2	...	3 2 0	...	2 10 4	...	2 12 10	...	5 5 0	
Total cost	...	...		...	75 0 0	...	61 6 2	...	62 2 8	...	55 10 6	..	46 15 10	...	46 5 2	...	34 2 0	...	29 2 4	...	30 13 2	...	58 12 0	Say 59 0 0

—9 INCH HOLLOW WALL—

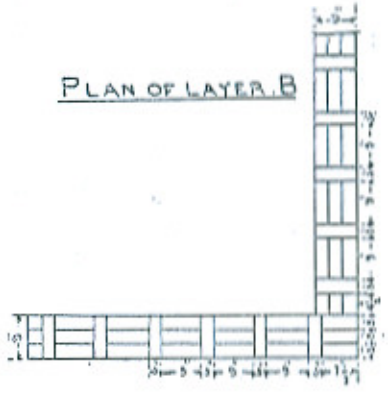
No. 4

SCALE 2 ft = 1 INCH

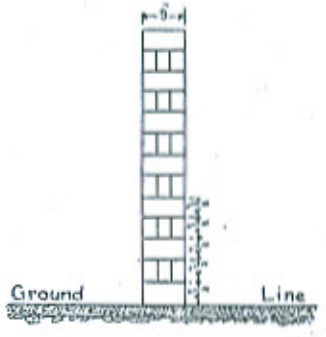
PLAN OF LAYER A



PLAN OF LAYER B



SECTION ON M.M



ISOMETRIC VIEW