The

Proposed U. P. Stub Line.

Rail Road.

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As a student of the Kansas State Agricultural College I have been between her walls for the past four years laboring to complete one of her courses and incidentally watching the growth of the institution. During this time many changes have necessarily taken place; especially in the line of improvement of her building accomodations. This period of time has seen her repair the old barn, lots, library building, chemical laboratory; build a new cow barn, silo, agricultural hall, physical science hall, and many minor improvements. Still she is in need of many other buildings such as a new chapel, a presidents mansion, a veterinary science building, all of which

must come about by state appropriations, — those needed most will probably be supplied first and will come no sooner than the college demand them.

Another present need of the college and one I believe necesary and highly beneficial is that of a switch or stub line railroad from the depot to the college; so I have taken it upon myself to survey and establish a grade line from the Union Pacific depot to the college shops.

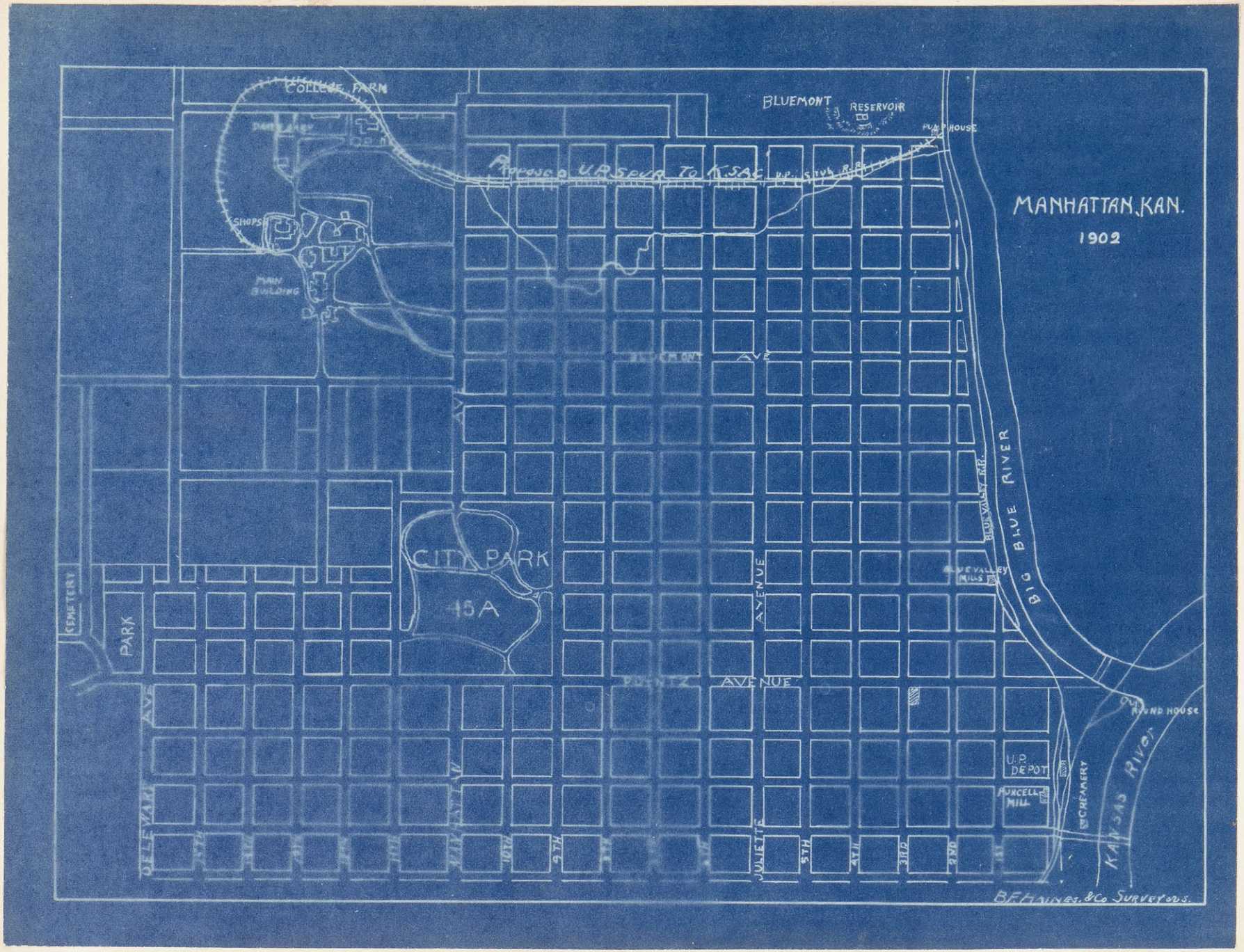
Though such an undertaking may seem highly improbable to some, I believe, some day a road will actually be established; and we will no longer draw coal, or our furniture, or our machinery a few hundred pounds at a time with horses, which is a heavy expense. Also we may ship directly from the college grounds any salable material such as grain, hogs, cattle, etc.; and our mechanical engineering students will reap the benefit

of handling an engine by rail as well as an ordinary traction engine.

I have chosen the Union Pacific rail road rather than the Rock Island to start from on account of its running nearer the college grounds, and from which the lay of the ground is more suitable for a cheap track, — the length of the route will be much shorter with a better or a lighter grade to ascend the college hill. I will utilize what is known as the Blue Valley Rail Road (and which road is owned by the Union Pacific Company) as far north as the bluff north of the city known as Bluemont. (See frontispiece for location of this).

From a point only a short distance north and east of the city water-works plant, I have staked out the stub line proper, and which line I will divide for convenience in description into two main divisions according to topographical features,

Plate II.


COLLEGE FARM
BLUEMONT RESERVOIR
PUMP HOUSE
PROPOSED U.P. SEWER TO K.S.A.C.
SHOPS
MAIN BUILDING
MANHATTAN, KAN.
1902
CITY PARK
15A
CEMETERY
PARK
POYNTZ AVENUE
BLUE VALLEY MILLS
BIG BLUE RIVER
ROUND HOUSE
U.P. DEPOT
PURCELL MILL
CREAMERY
KANSAS RIVER
JULIETTE
DELAWARE AVE
B.F. HAINES & Co SURVEYORS.

comparatively level and even with a gradual rise in elevation to station (0). From station (0) we make a 2° curve to the right to station (2), thence N. 50° 5' W. for 1200 feet. From station (14) a left curve of 9° 42' to station (24) where we again turn to the left, with a curve of 5° 42' until the highest point of the hill is reached station (33) where we compound the curve with our sharpest curve 11° 28' which carries us to the machine shops along-side the boiler room at station (45)

Between station (8) and (9) we have crossed a branch or small ravine which is some fifty feet in width but not more than four feet deep; From this point the grade grows gradually steeper but the line is swung around the hill in such a way that the grade is materially lessened.

The route I have chosen has the advantage of a cheap right of way.

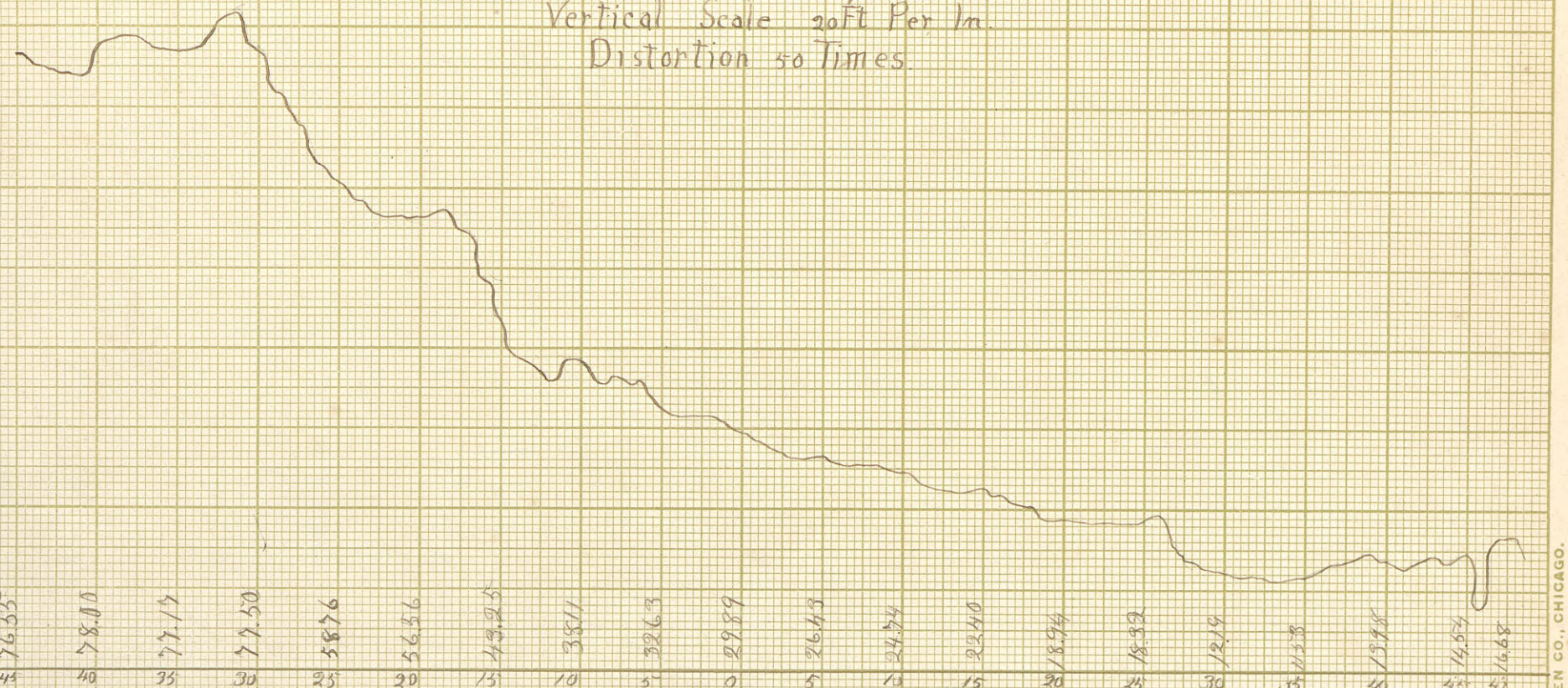
namely, (1) eastern or level portion, and western or heavy grade portion. These two divisions include the whole line and the former is 4700 feet in length, while the latter is but 200 feet less making the entire length 9200 feet.

At the point just above stated we will begin the description of the new survey. I have designed that the approach shall be a switch from the north. From thence we swing to the right with a four degree curve to station (33) thus hugging close to the foot of Bluemont. (See outline of U.P. S.L.R.R. on plate 4.) After passing around the corner of Bluemont, we taper off to a straight line track by the use of a 2° curve to the right, forming what is known as a compound curve, to station (30); then due westward upon the public highway to the northwest corner of the city limits, station (0) where we then enter upon the western division. Thus far the ground is

PLATE III

PROFILE MAP OF STUB LINE.

Horizontal Scale 1000 ft Per Inch.
Vertical Scale 20 Ft Per In.
Distortion 50 Times.



as the principal part of it is located upon the college grounds or upon the public highway. There is about three hundred and fifty yards of it at the extreme eastern end which angles across three lots in succession that border on Bluemont; and as these are in an out of way place and the soil not very rich, the land is not very valuable. (See plate II).

Taking the line as a whole there is sixty two feet of rise to be made from the city waterworks plant and the greater part of this must be made between station (0) and (34) W., that is, only thirteen feet rise from (47 E.) to (0); and 49 ft. from (0) to (34 W.). Along the route the eastern half is a slow gradual rise and increases toward the toward the west until station (34) is reached which is at the highest point. Plate III will give an idea of the surface of the land as it is a true profile of the land along the

route.

The grade as established corresponds as nearly as possible to the surface of the soil as I can make it, and still have the grade very gradual. By so doing the deepest cut is about four and one half feet and such depth is kept for only about one hundred feet between stations (94) and (91). On the following plate, (plate IV) will be seen a profile map of the line after the grade is established showing the various grades, and a comparison of this and the outline or profile upon it corresponding to the surface of the ground will give the various differences between the natural lay of the ground and that after the grade is established. In order that a detailed and accurate account of the different grades of the line may be at hand for ready reference I will insert the following table.

PLATE IV

PROFILE MAP OF STUB LINE, SHOWING GRADES

Horizontal Scale 100 Ft Per In.
Vertical Scale 20 Ft Per In.
Distortion 50 Times.

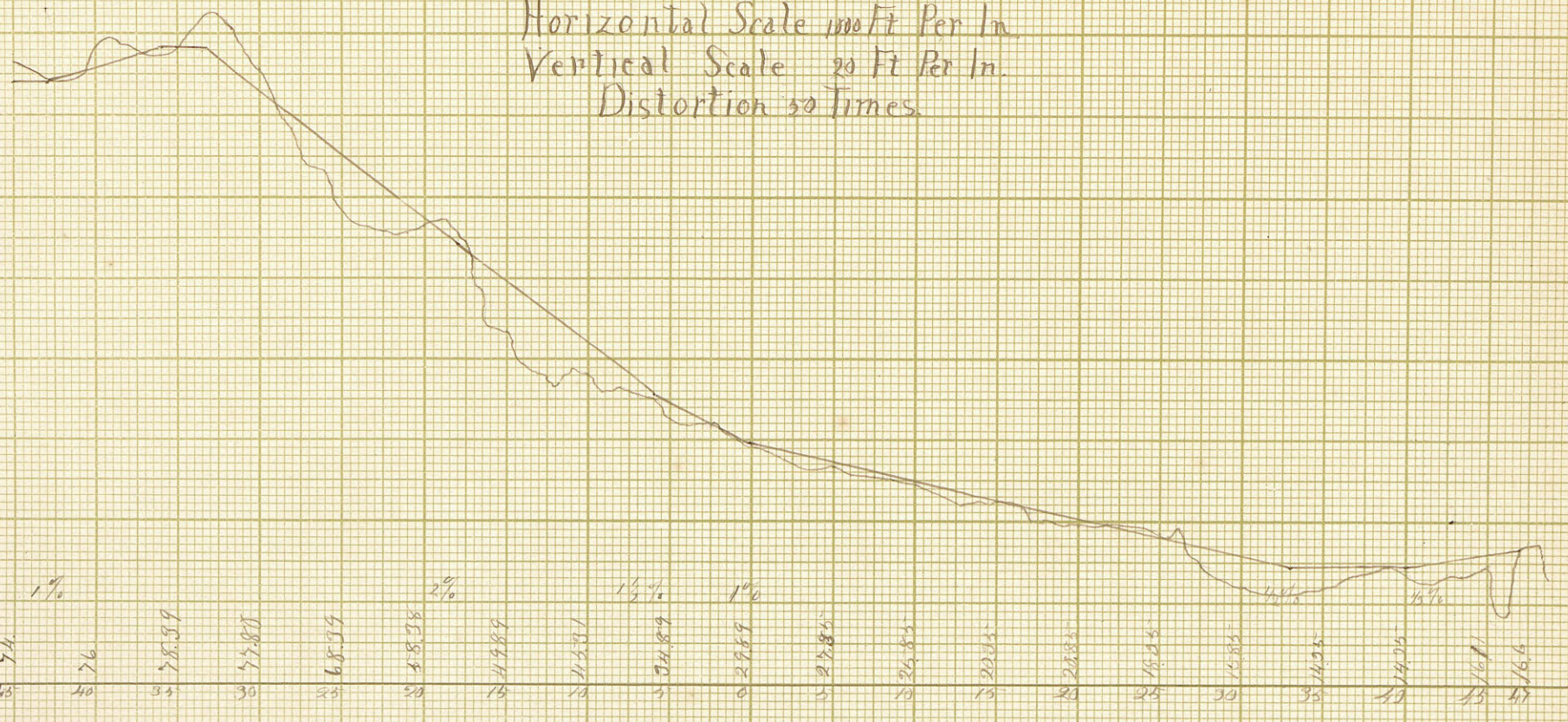


Table showing degrees of grades of various subdivisions.

	From Sta.	To Sta.	Length of G. in ft.
1/3% fall or down grade	47E.	40 E.	600
Level	40 "	36 "	400
1/2% grade	36 "	0	3600
1% "	0 "	6 W.	600
1 1/2% "	6 W.	18 "	1200
2% "	18 "	34 "	1600
Level	34 "	36 "	200
1% fall or down grade	36 "	45 "	900

As a natural consequence in all railroading, curves must be had at various intervals to get to different points in the country or to avoid a bluff, or ravine, etc. Upon this line will be discovered six curves, none of which are very sharp excepting one which is between station (33) and (43) W. which is 11° 28'. For a table and detailed account of such I insert the following.

Table of A. P. Stub Line showing various curves and length of each.

	ft.	From Sta.	To Sta.	ft.
Eastern or level portion	4700	0	47 E.	
Straight Line		0	32 "	3200
2° curve		32 E	42 "	1000
4° "		42 "	47 "	500
Western or heavy grade	4500	0	45 W.	
2° curve		0	2 "	200
Straight line		2 W.	14 "	1200
9° 42' curve		14 "	24 "	1000
5° 12' "		24 "	33 "	900
11° 28' "		33 "	43 "	1000
Straight line		43 "	45 "	200
				9200

Since the surface of the ground corresponds so closely to the grade of the line, the moving of the earthwork is not such a difficult problem, most of it being rich soil. I have made no such requirements as deep cuts, so there will be no hardpan, or stone, or even very hard dirt to move. And as the slopes

are so gradual there is very little difference in the computation of the exact state and the assuming that the ground is level, so I have taken the latter method. Such computation of the number of yards of dirt to be moved are more or less close approximations at best on account of variations of the surface of the ground in short distances. Perhaps a brief account of my original work in levelling would be interesting at this point, so I will give on the following page, readings at various places along the line. I first worked toward the east from station (0); and then again from that point westward.

Table of Original Readings.

No of Sta.	+ Sta.	H. of I.	- Sta.	Elev.	Remarks.
0	873	30.873		30.	Datum 30 ft.
1 E.			.981	29.892	
4 "			4.183	26.698	
5 "			4.608	26.265	
10 "			5.636	25.237	

No. of Sta.	+ Sta.	H. of I.	− Sta.	El.	Remarks.
13			8.131	22.742	
18 T.P.	2.533	23.511	9.895	20.978	
20			4.611	18.90	
22			4.688	18.823	
26			9.601	13.910	
29 T.P.	5.081	87.803	10.788	12.722	
30			5.605	12.198	
33			6.609	11.194	
34			6.399	11.404	
35			6.264	11.539	
36			5.269	12.534	
37 T.P.	9.257	22.627	4.433	13.37	
40			8.698	13.929	
42 T.P.	5.293	18.921	8.999	13.628	
45			4.378	14.543	(43 is 49 l. from (46) in curve.
47			2.239	16.682	
O. B.M.	6.06	36.		30	From (0) W.
5			3.430	32.630	
6 T.P.	5.077	40.298	0.899	35.161	
7 T.P.	7.067	42.821	4.484	37.754	
10			4.708	38.113	
11. T.P.	3.136	42.097	3.860	38.961	
13. T.P.	7.765	45.791	4.066	38.031	
14 T.P.	11.411	50.433	6.774	39.822	

no. of Sta.	+ Sta.	H. of I.	— Sta.	Elev.	Remarks.
15.			10.182	40.257	
17. T.P.	12.400	68.988	1.845	48.588	
20			4.426	56.562	
22			5.395	55.593	
24. T.P.	9.728	66.472	4.244	56.744	
27 T.P.	9.546	73.462	2.556	63.916	
28			5.252	68.210	
29. T.P.	11.676	83.514	1.624	71.838	
30			8.152	75.362	
31.			4.912	78.602	
33. T.P.	3.855	86.572	0.797	82.717	
34			5.745	80.827	
35			8.800	77.772	
36			9.450	77.122	
39. T.P.	2.609	83.062	7.119	79.453	
40			4.188	78.874	
45				74.000	

In the table following this will be given the figures showing the earth-work to be done in grading. Figures will be given for every few hundred feet, as it will not be necessary on such a

gradual slope to cross-section at every station. The first column from the left gives the number of the stations; in the second column (column L.) the numerator indicates the side distance of beginning of cut or fill, while the denominator indicates the depth of cut or rise of fill with reference to the surface of the ground. The (+) sign indicates above road-bd; (−) below grade or road-bed. As the right hand section is the same as left (L) by assumption, I will not indicate it with a second column. C.L. = centre line.

Table showing figures for earth-work on U.P.S.L.R.R.

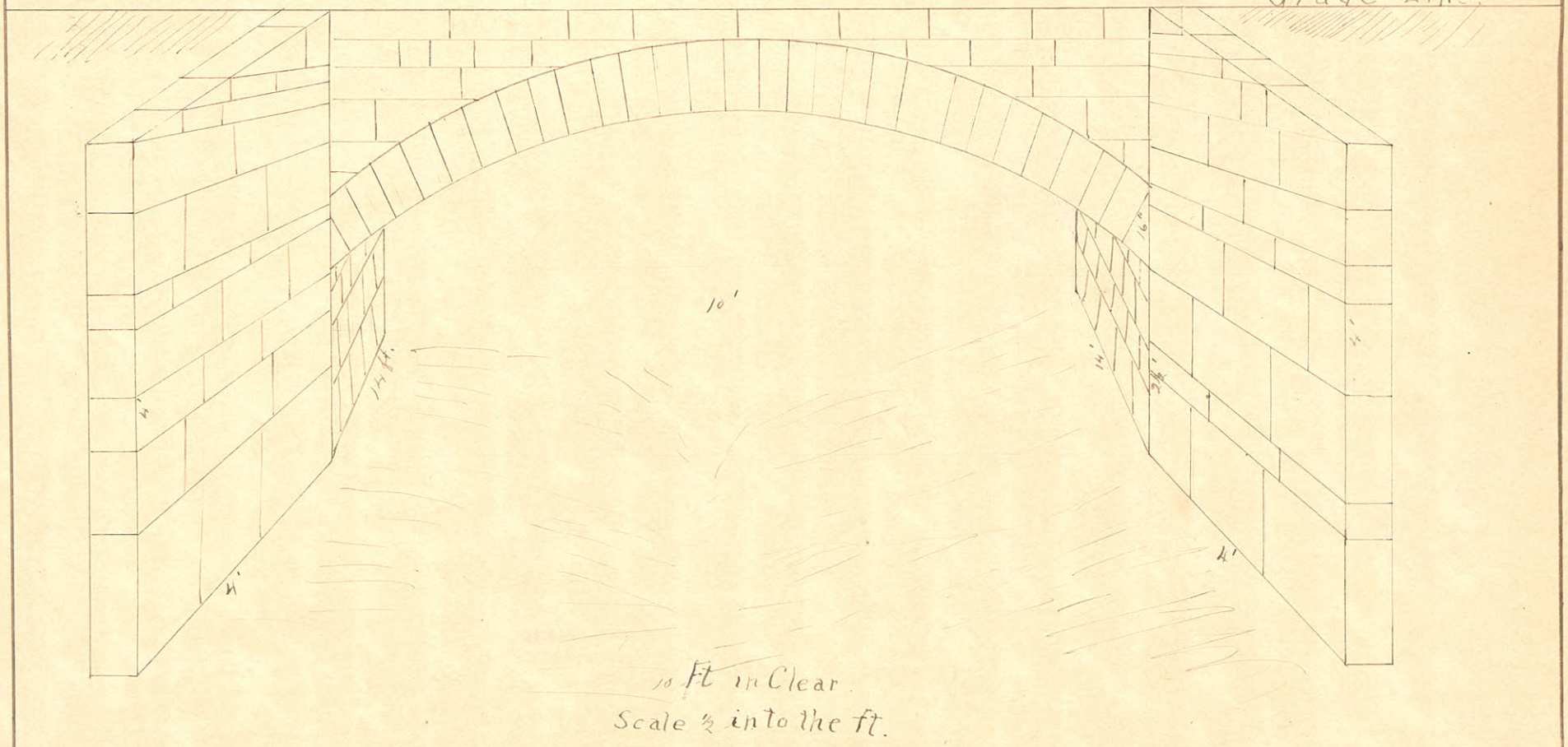
Sta.	L.	C.L.
45 W.	$\frac{9.5}{+2.5}$	+2.5
43 "	$\frac{7.5}{+.5}$	+.5
40 "	$\frac{9.8}{+2.8}$	+2.8
36 "	$\frac{8.2}{-1.2}$	−1.2
34 "	$\frac{9.4}{+2.4}$	+2.4
33 "	$\frac{8.1}{+1.1}$	+1.1

Sta.	L.	C.L.
31 "	6.3 / +1.3	+1.3
29 "	11.1 / −4.1	−4.1
28 "	13.1 / 6.7	−6.1
22 "	13.7 / 6.7	−6.7
18 "	8.1 / +1.1	+1.1
13 "	15.8 / −8.8	−8.8
10 "	11.2 / −4.2	−4.2
7 "	7.8 / −.8	−.8
4 "	6.9 / 1.9	−1.9
1 "	7.1 / −1	−.1
5 E.	8.4 / 1.4	−1.4
10 "	8.1 / −1.1	−1.1
15 "	7.9 / −.9	−.9
20 "	8.9 / −1.9	−1.9
25 "	00	0
30 "	10.6 / −3.6	−3.6
35 "	9.8 / −2.8	−2.8
40 "	7.4 / −.4	−.4
45 "	8.1 / −1.1	−1.1
46 "	15.3 / −8.3	−8.3
47 "	00	0.0

The road-bed is designed to be fourteen feet wide through the entire length and is to contain only a single track. In all fills and cuts I have used a slope of one to one as the ground will admit of one no steeper than this. Along the entire line there is no place but what a siphon or a small drain would be sufficient to allow the passage of all surface water, excepting between stations (8) and (9) where the grade crosses a small ravine in which a quantity of water flows at times, and for which place the plate following (Plate V.) gives the design of a stone bridge.

This bridge is designed to be ten feet in the clear with abutments. The width is the same as that of the grade, and the wings of the abutments stand at an angle of 30° to the bridge and are four feet in length. The foundation of the walls must be laid sixteen inches in the ground and the walls are to be not less than sixteen inches in thickness at any place. Each end of the arch will begin two and

PLATE V.



10 Ft in Clear.

Scale ½ in to the ft.

one half feet above the surface of the ground. Stones of sixteen inches in length will be used in building the arch. The perpendicular height of the walls at the end of the arch shall be five and one half feet, and the end of abutment wings decreases to four feet in height.

The rails used in this track are designed to be of steel, of the weight of 30 kil. per lineal metre, and are to be laid upon ties sixteen inches apart.