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Specifications for a System of Irrigation for College Grounds

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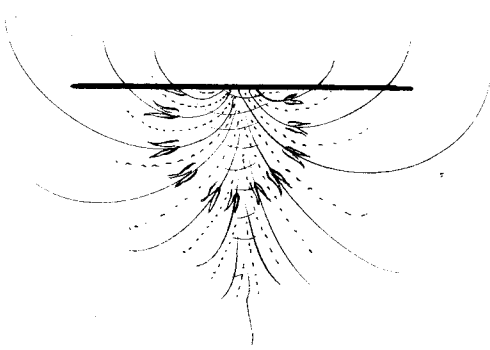
Thesis,

Subject:-

Specifications for a System of
Irrigation for College Grounds.

By *J. M. Cornell*

S. D. A. C. Class of "95"



3888

"T H E S I S".

-:-:-:-:-:-:-:-:-:-:-:-

Specifications for a system of irrigation for College grounds:

The rainfall of this portion of country not being sufficient, or if sufficient not uniformly distributed, it has become necessary to successful work in agriculture that provision be made for a system of irrigation which will tide agriculturists over a dry season or be a means of supply when most needed.

Deeming it therefore a prime requisite to successful experimenting along agricultural lines, I thought of planning a system of irrigation which could be profitably and advantageously applied to the grounds of the South Dakota Agricultural College.

My plan is simply to give drawings, data, cost and location of a system which will irrigate eighty acres of land by covering ten acres of land at a time with one inch of water; this requiring an amount of water which, under existing circumstances, will be all that can profitably be supplied during the interval of application of water. An inch of water seldom being needed, the entire surface may be flooded about once a month. The use of this supply when most needed together with our annual rainfall will certainly be an insurance against drought.

I find upon surveying the College grounds that the difference in level of the highest point and the lowest is 30 ft. (see blue print) That the College hall is located on the highest ridge of land, which extends from the observatory to the entomology building, and which varies between two and three feet, the highest point being the north-west corner of the College hall. From the College hall north the slope is toward the north. The remaining portion of the campus sloping to the south-west. The land devoted to orchards, forests and horticulture slopes gradually from the south to the north, the greatest difference in level being about twenty feet.

Plate I is a diagram showing approximately the contour of the College grounds. By placing a reservoir south-east of the entomology building about one hundred feet from the south line of the College grounds a site can be obtained by which access can be had to all portions. By running two distributing ditches, one directly to the south line of the grounds; from here due east to the eastern side, thence north to the northern side; the other due north from reservoir; one will be able, with the aid of lateral ditches, to irrigate very successfully all the land devoted to orchards, forests and horticulture. By running a distributing pipe north-west from reservoir one will be able, by attaching hose here and there, to irrigate that portion known as the College campus.

(see blue print). According to W.P. Butler the amount of water necessary to flood ten acres of land one inch deep is thirty six thousand three hundred cubic feet or two hundred seventy one thousand and five hundred forty two gallons. A wind mill with a capacity of fifty two barrels per hour will easily supply that amount in seven days running twenty four hours a day. The cost of such a wind-mill will vary from \$100,00 to \$200,00.

By taking an inside slope of two to one the frustrum of a cone with diameters respectively eighty seven and forty seven, with altitude of ten feet, will hold thirty six thousand three hundred cubic feet of water. (see plate 2).

For distributing ditches, four feet wide at bottom, two feet deep, the first foot a slope of one to one, the second foot a slope of one to one and a half, will be amply large enough to convey the water where it is wanted. (see plate 3). For stationary lateral ditches one half that size will be sufficient. The water is let in to the ditches by means of gates. (see plate 4).

In irrigating the campus, I find that the best results can be obtained by having a two inch galvanized pipe for a greater share of the way, the remaining few hundred feet respectively being $1 \frac{1}{2}$ and $1 \frac{1}{4}$ inch galvanized pipe. It should be connected with reservoir about five feet above the level of the surrounding grounds, and should be placed just below the surface and so arranged that

by the use of reducing tees, hose may be attached every one hundred seventy five or two hundred feet. It will be necessary in several instances (see blue print) to have 1 1/2 inch pipes attached to the main pipes. These lateral pipes will have hose attached to them and will terminate in an elbow, the same as the main pipe. The water can be drained off by means of valves, located at the ends of all lateral pipes and at the low points in the main pipe.

The volume of earth to be excavated in reservoir is two hundred fifty cubic yards. The number of cubic yards in wall is twelve hundred thirty six. The difference, nine hundred eighty six cubic yards, will have to be supplied in making the wall. Assuming that this extra amount will have to be excavated, it will make the total amount of earth to be removed, twelve hundred thirty six cubic yards, which at eight cents per cubic yard, will cost \$99.00. The total number of cubic yards in ditches (see blue print) to be removed will be two thousand seventy. Estimating, the cost of removal of this at five cents per cubic yard, which is high, the cost will be \$104.00.

On account of the depression. a flume (see plate 5) will be necessary from station 14 (H.S.55.47) to station 24 (H.S.56.50) a distance of one thousand feet. This flume can be supported by

an earth bank all the way except at station 20.40, where a small trestle, twenty feet long, better be placed to insure the ditch against high water at that point. The cost of such a flume which ought to be made of two inch plank will (reckoning lumber at \$20.00 per thousand) be \$160.00.

Cost of Wind-Mill	\$150.00
Excavation for reservoir	99.00
" " Ditches	104.00
Erection of Flume	160.00
Pipes, Hose and attachments	415.00
3 Gates for Reservoirs	36.00
6 Dams	<u>5.00</u>
Total cost	\$969.00

The foregoing estimate will approximate the cost of putting in such a system of irrigation. By locating the pipes and ditches as indicated in blue print, the water supply will be as economically and judiciously applied as seemed practicable.

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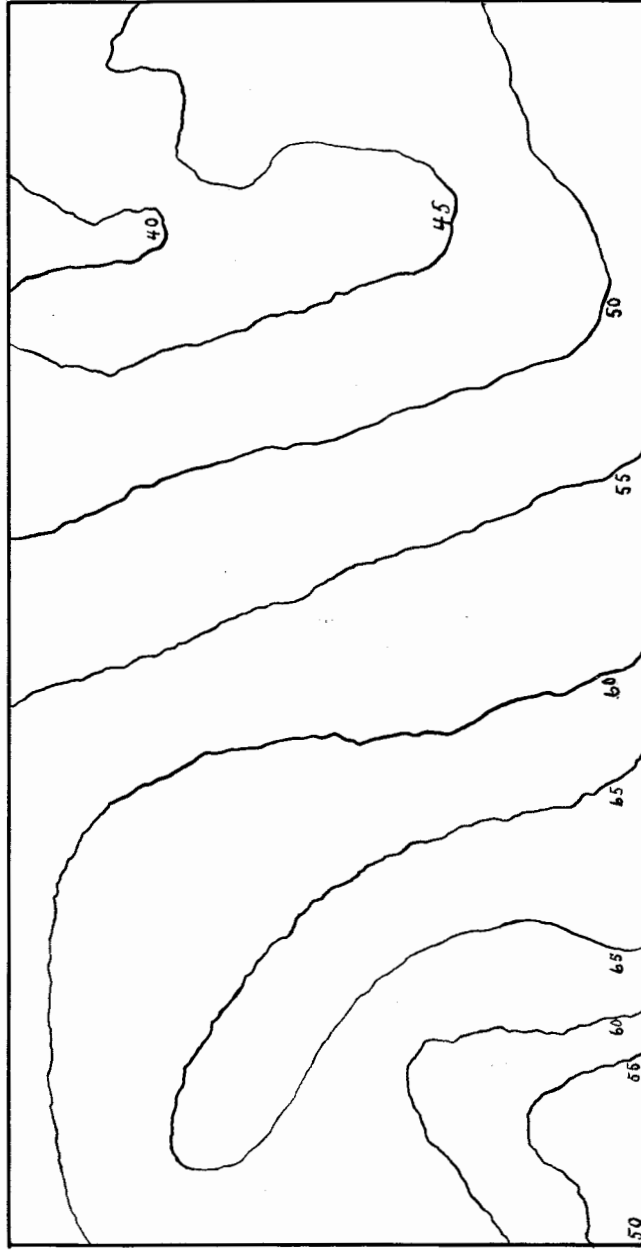
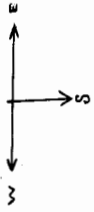


PLATE I

Contour of college grounds.

scale $\frac{1}{4}''=1'$.

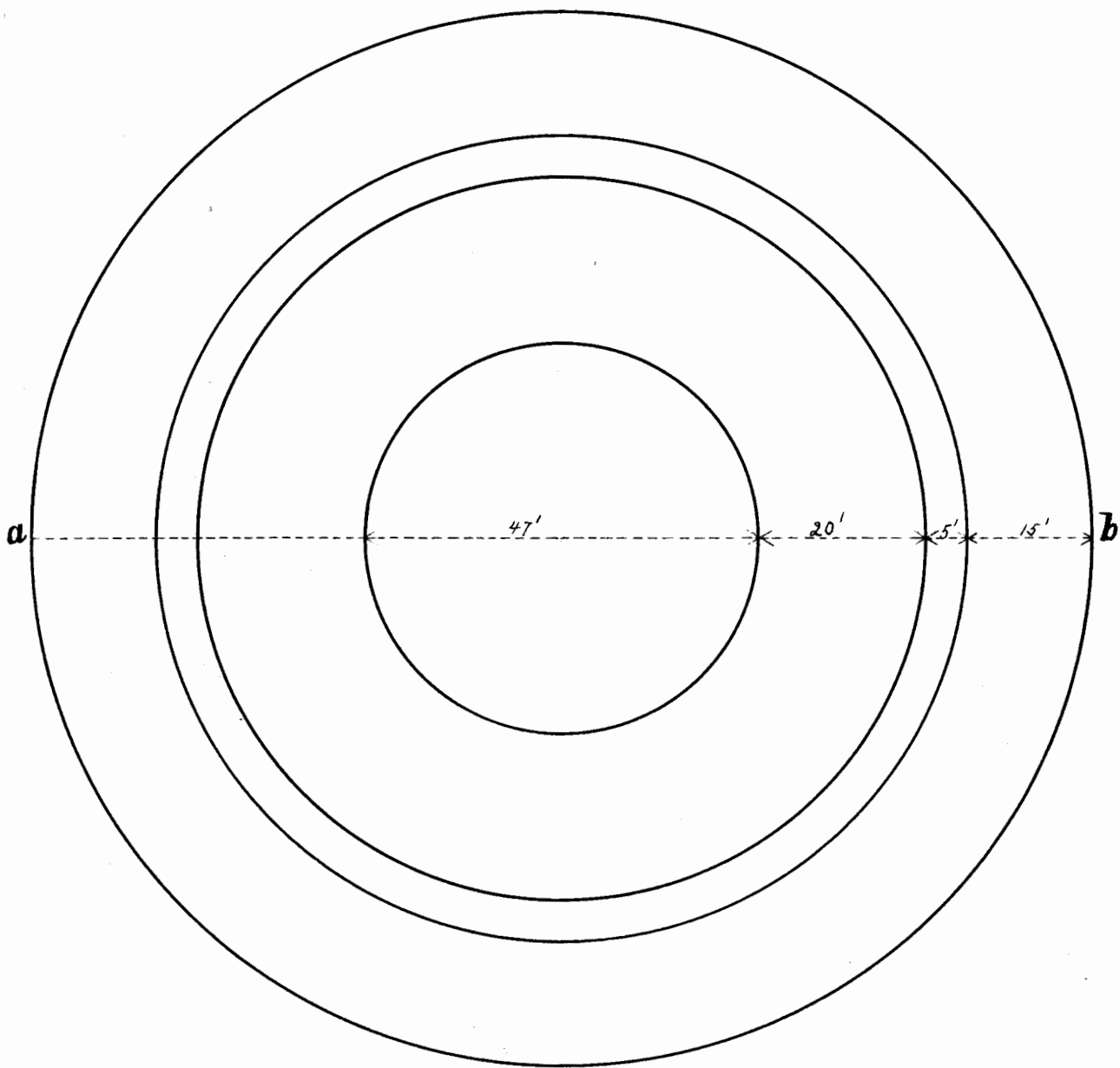


PLATE III [A]

Top elevation of reservoir

scale $\frac{1}{20}''=1'$

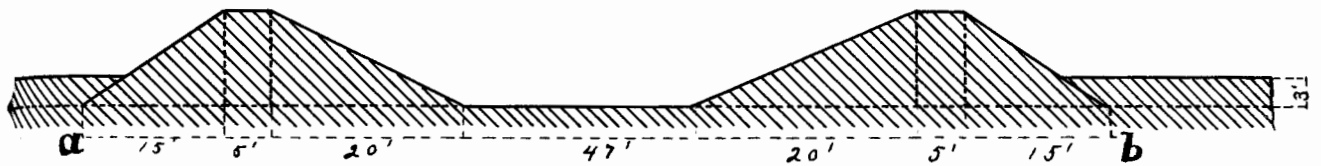


PLATE II (B)

*Cross section of reservoir
through diameter*

scale $\frac{1}{20}''=1'$

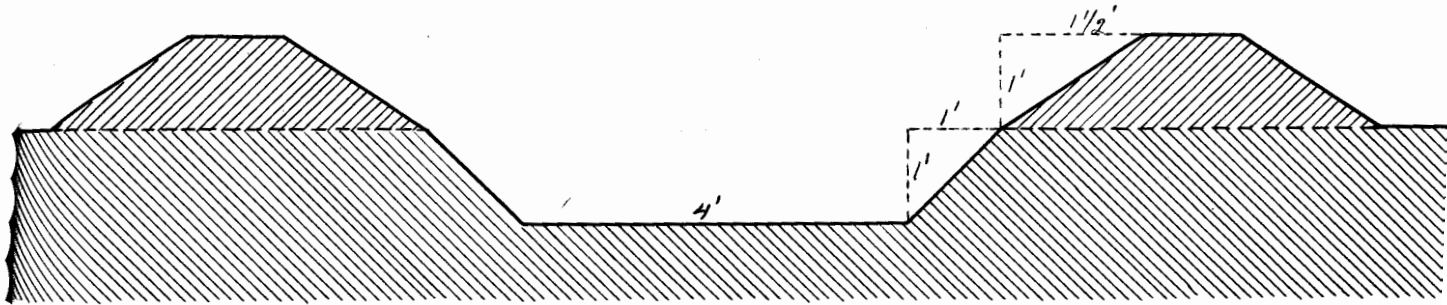


PLATE III

Cross section of ditch.

scale $\frac{1}{4}''=1'$

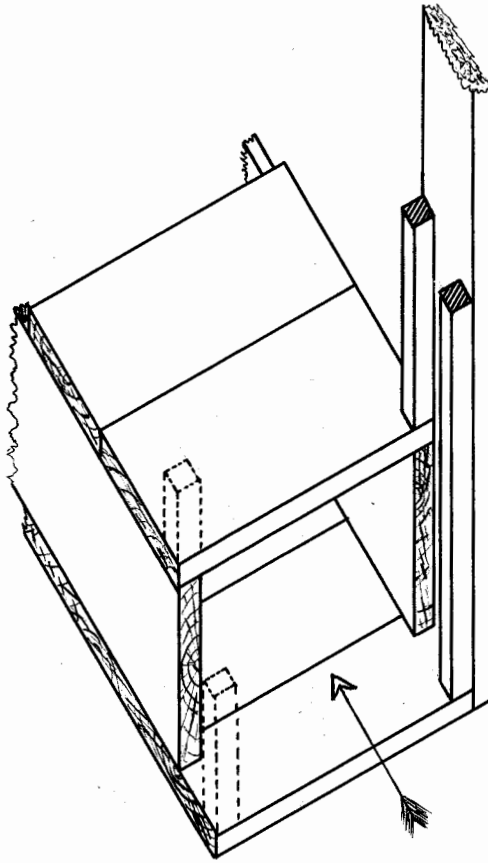
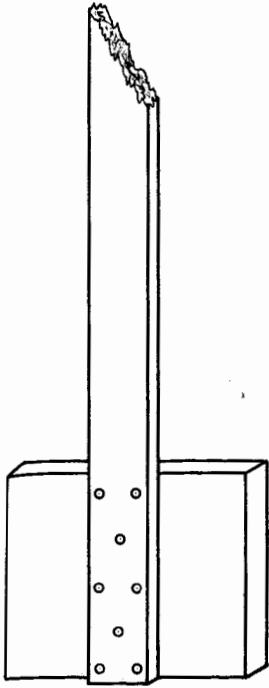


PLATE IV

Form for gate in reservoir.

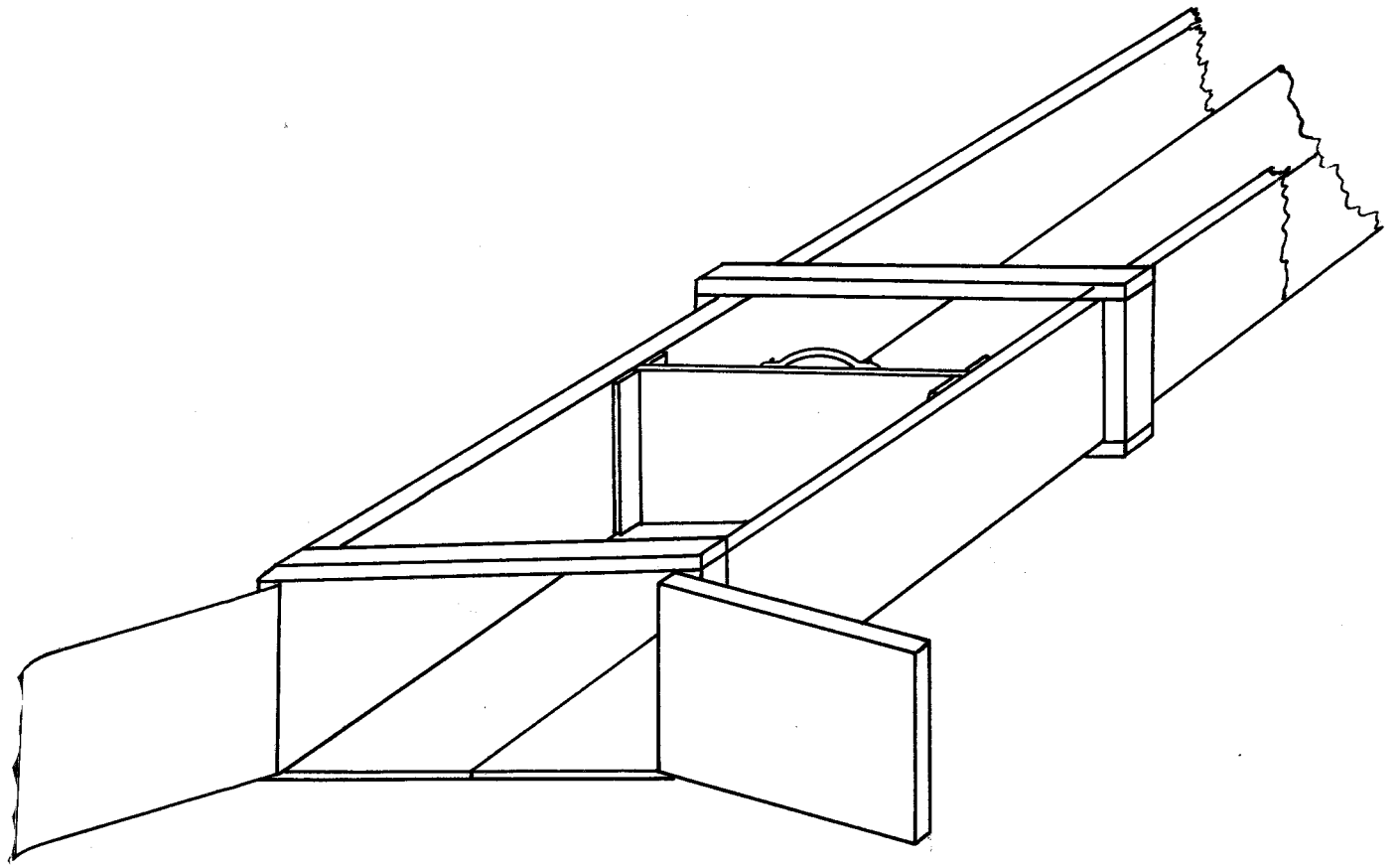


PLATE V

Form for a flume.

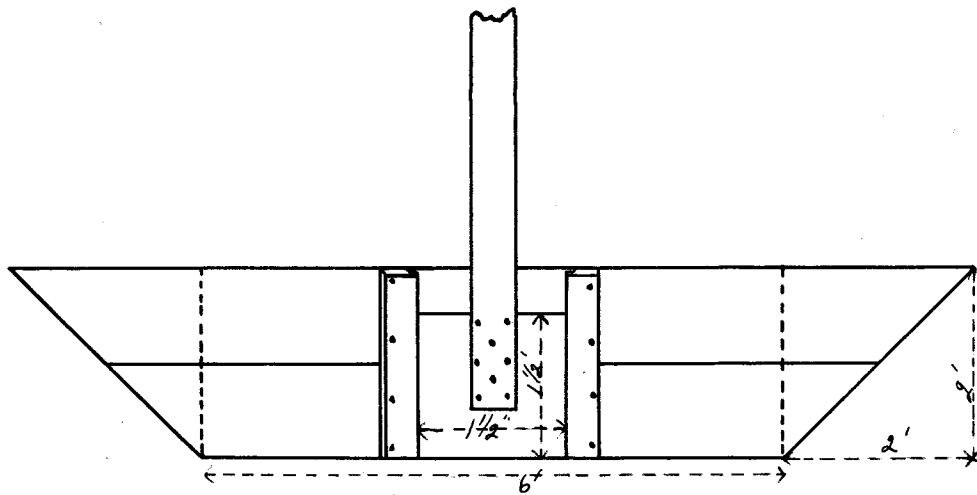
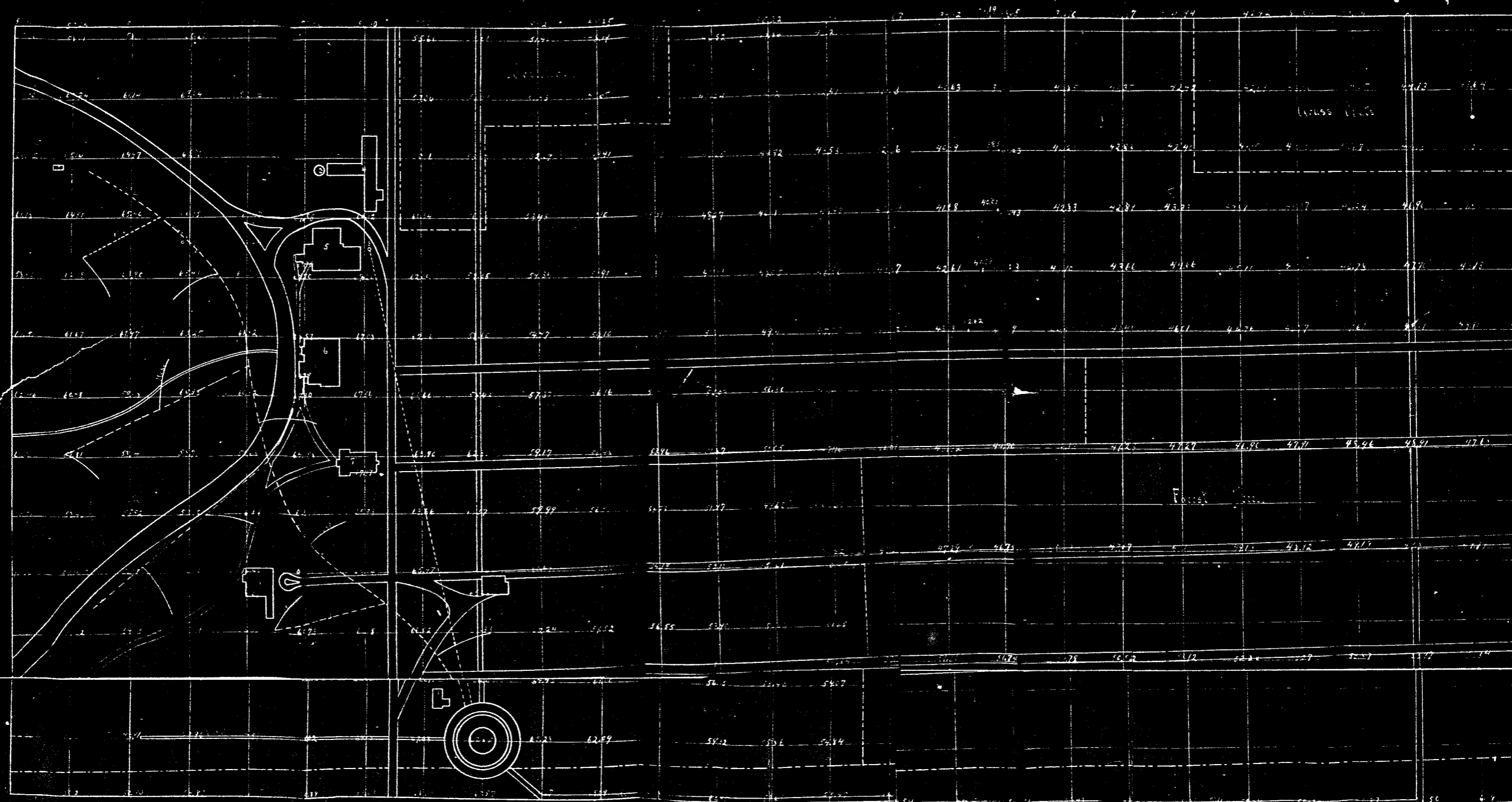


PLATE VI

Movable dam for ditch.

COLLEGE GROUNDS.



- | | |
|---------------------|---------------------|
| 1. Observatory | 6. College Hall |
| 2. Flag Staff | 7. Library |
| 3. Water Tank | 8. Green House |
| 4. Shops | 9. Hort. Barn |
| 5. Ladies Dormitory | 10. Entomology Bldg |
| 11. Resivoir | 12. Wind Mill |

Surveyed and drawn by

H.M. Cornell

S.D.A.C. "95"

Scale

1" = 100'