

On the Cost of Irrigation by Electrically Driven Pumps From Transmission Services

BY W. W. WHEELER.

When a transmission system arrives at that inevitable stage of development wherein it reaches into outlying farming communities for the purpose of building up a pumping load as well as of developing the productiveness of the country that is to be tributary to its lines, the question that is most frequently asked is: "What will it cost to irrigate an acre of land with water pumped by electrical power?"

To answer this question with any close degree of accuracy requires an intimate knowledge of the conditions which prevail regarding several factors—namely, the cost of power, the character of the lands to be irrigated, and the depth from which the water must be raised. My own experience is mainly confined to the territory covered by the transmission circuits of the Northern California Power company, operating in that portion of the northern part of the Sacramento valley contained in portions of Shasta, Tehama and Glenn counties in northern California, an experience which this paper reflects.

In the popular mind irrigation implies a gravity or surface catchment for delivering water to the land, but in recent years pumping has become more and more recognized by engineers as the most economical means for supplying water for all irrigating purposes, and it is destined to grow in importance as the cost of power becomes less through the development of transmission enterprises. Lands that lie beyond the economic reach of gravity supplies of water are often entirely reclaimable by pumping, and numerous cases exist where both systems are available for use, but in practically every case the advantage as to cost and operating expense is found to be on the side of the pumping plant. The vagaries of the wind make the windmills unreliable, gasoline engines, though very efficient as to fuel consumption, require great care and are expensive to install, steam power is not to be considered except in large units because of the heavy first cost and the expense of operation and attendance, but with electric power rests every advantage in cheapness of installation and operation. These plants require practically no attendance and the power is reliable.

Of the many types of pumps available and in use for irrigation the most common perhaps is the centrifugal pump, which is made on the Pacific coast in standard sizes ranging from two inches to fifteen inches in suction and discharge pipe diameters, and on special order can be made in any size required. The first cost for a complete electric motor and centrifugal pumping plant will depend on the size of the plant and the type of motor used. For small plants capable of irrigating one hundred acres or less, the first cost will usually range from twelve dollars to fifteen dollars per irrigated acre, while the cost of operation will be found to vary from two dollars and seventy-five cents to three dollars and seventy-five cents per irrigated acre.

In this connection it will be of interest to refer to an estimate recently made by the United States geological survey for an extensive pumping system designed to irrigate some 500,000 acres of land in the San Joaquin valley of California. This estimate indicated the first cost of the plant to be about four dollars per acre, and the annual cost of operation and maintenance to be fifty cents per acre-foot, or approximately one dollar per year per acre irrigated. When it is borne in mind that the average cost of installation of gravity supply systems in California has been about thirteen dollars per acre, and that the annual charge for irrigation averages one dollar and sixty cents per acre, the great possibilities of pumping can be appreciated.

The circuits of the Northern California Power company extend down the Sacramento valley from Redding as far as Vina in Tehama county on the east side of the Sacramento river, and Willows, Glenn county, on the west side, and as a general statement it may be said that within this great district land can be irrigated for one hundred days, which covers the period of the year during which irrigation is necessary, at a cost of two dollars and fifty-four cents per acre. In this the water which will be distributed is equivalent to a twenty-four-inch rainfall. This estimate is based on water being lifted from a depth of thirty feet to irrigate a tract of one hundred acres of land, and the expenditure necessary for doing so would amount to fifteen dollars an acre for the installation of a centrifugal pump direct-driven by a fifteen-horse-power induction motor. The cost for power for this period of one hundred days in the territory defined, is at the rate of thirty-five dollars per horse-power-year, and the cost for maintenance is prac-

tically nothing. In fairness, however, due cognizance must be taken for the interest on the money invested and as the cost per acre for a pumping plant to irrigate a one-hundred-acre tract is fifteen dollars, the interest on this investment for one year at six per cent is ninety cents. This amount should be added to the two dollars and fifty-four cents paid for power, making the total cost per acre for the irrigation necessary during one year to be three dollars and forty-four cents. If to this be added the very liberal estimate of six cents per acre for incidentals, the total cost will not be far from three dollars and fifty cents per acre per year.

Some specific instances will prove convincing: At Redding there is a pumping plant consisting of a fifty-horse-power type C Westinghouse induction motor, belted to an eight-inch horizontal centrifugal Jackson pump that delivers eighty miners' inches of water per square inch, and with a suction lift of fifteen feet through 4500 feet of eight-inch riveted pipe. This plant supplies water for gardens, orchards and alfalfa lands, and the water is sold at the rate of ten cents per inch per twenty-four-hours' service.

About one mile south of Redding a seven and one-half-horse-power type C induction motor, belt drives a four-inch Jackson centrifugal pump of the vertical tower type, which lifts 275 gallons of water a minute to a height of twenty-seven feet for the irrigation of twenty-five acres of alfalfa. This plant was installed about three years ago and the owner if authority for the statement that during the first year of its operation the increased productiveness of the land, because of irrigation, enabled him to clear enough therefrom to pay for one-half of the first cost of the plant in addition to his yearly power bill amounting to \$175.

About one mile further down the

Sacramento river a somewhat similar plant is being installed. This plant consists of a ten-horse-power type C motor belted to a No. 5 Gould centrifugal pump which will lift water to a height of thirty-two feet for the irrigation of fifteen acres of alfalfa and six acres of garden land.

At Anderson the Bellevue Irrigation company is operating a fifty-horse-power type C induction motor, which is direct-connected to a ten-inch Krough "Patented California pump" having a double eight-inch suction and a ten-inch discharge opening. This equipment, which is securely anchored to bedrock, is placed over the water on a platform that is eight feet above the low-water mark. The two suction pipes project about three feet below the surface of low water and are surrounded by floating wooden platforms, the purpose of which is to prevent the formation of whirlpools and the sucking of air into the pump. The discharge pipe, which is eighteen inches in diameter and fifty-four feet long, is made of No. 16 steel with flanged joints bolted together and connected to the pump by means of a taper joint. This plant shows an efficiency of seventy-two per cent and discharges 489.3 cubic feet of water per minute into a large wooden box located at the head of the ditch leading to the reservoir. This ditch is 1800 feet in length, and for a distance of 600 feet it is built up eight feet above the ground. Its grade is one-eighth of an inch to the rod, and measures seven feet across the top, four feet across the bottom, with a depth of three and one-half feet. The reservoir, which is nearly circular in form with a diameter of 200 feet, was formed by scraping up dirt and throwing it up into a levee, and when filled holds approximately 160,000 cubic feet of water. The main canal leading from the reservoir is 7850 feet long, ten feet wide and four feet deep, and at its lower end there are

three measuring boxes each feeding lateral ditches for distributing water over some 400 acres of prune orchard and 100 acres of alfalfa. Water from this system is sold at the rate of ten cents per miners' inch, under a four-inch pressure per twenty hours. It may be added that in or about Anderson there are several small pumping plants, ranging in capacity from one-half to two horse-power.

At Cottonwood there are also several small plants of the sizes last indicated, together with a number of others, one of which consists of a five-horse-power Wagner single-phase motor belted to a three-inch vertical centrifugal pump of Krough manufacture, which lifts 215 gallons of water per minute to a total height of twenty-six feet through a six-inch casing pipe about forty feet long. This pump irrigates twenty-six acres of alfalfa, and last year the total cost of power for its operation was \$65.40.

At Red Bluff a thirty-horse-power type C induction motor operates by belt connection an ancient type of five-inch Jackson centrifugal pump which is used for the irrigation of 135 acres of orchard lands. The plant raises 315 gallons of water forty-eight feet through 900 feet of ten-inch pipe, and last year the cost of power for its operation was \$314.11.

Several pumping plants are to be found at Red Bluff, but perhaps the most interesting consists of a seven and one-half-horse-power Wagner single-phase motor which is belted to a No. 2 1-2 Fulton power head for the operation of a cylinder five by eighty inches in size. This cylinder is placed eighty-nine feet from the top of the well which was bored by the county of Tehama for experimental purposes with the idea of ascertaining if it were possible to obtain artesian water. Originally the well was drilled to a depth of 1375 feet, but as a natural flow of water was not obtained at that depth, it was decided to open out the well with dynamite. Owing to an accident, however, the charge went off prematurely in the neighborhood of 500 feet from the top, with the result

that its depth is now only 475 feet, but it gives an unlimited supply of water. It is a ten-inch bored well with steel casing.

Three miles below Red Bluff on the Sacramento river there is a twenty-horse-power induction motor which drives by direct-connection a Krough centrifugal pump that lifts 1600 gallons of water per minute to a height of twenty-six feet with a total or over all efficiency of sixty-nine per cent. This plant irrigates eighty acres of alfalfa; it runs approximately eight days during each week, and the land it irrigates raises annually seven crops of alfalfa at a cost of \$185 per year for power.

At Tehama there are several small plants most of which are for domestic and household uses, but one of them is worthy of special note in that it consists of a three-horse-power Wagner single-phase motor driving by direct-connection a Gould triplex plunger pump which supplies the town with water.

At Corning there are in particular two ten-horse-power plants each of which furnishes water for the irrigation of orange groves, each motor being of the induction type and connected to its respective pump by belt- ing. In the first installation a tower type Byron Jackson two and one-half-inch pump lift water a total of 135 feet through lines of three-inch redwood pipe, each 1100 feet long, whence the water is delivered to a reservoir from which it flows by gravity over a forty-acre orange tract. The cost of power for the operation of this plant last year was \$225. In the second plant a three-inch centrifugal pump of the horizontal shaft type lifts water to a height of sixty-five feet through 350 feet of five-inch standard screw-iron pipe into a concrete reservoir forty feet long, thirty feet wide and twelve feet deep, whence it is drawn through ditches for the irrigation of thirty acres of orange land. In this plant last year the cost of power was \$223.15.

At Corning and Orland there are some twenty-odd electric pumping plants which range in capacity from one-half horse-power up to seven and one-half horse-power and are used

for various purposes, such as watering stock, irrigating orchards, berry patches, vegetable gardens, lawns, and for general household purposes.

Why electrically driven pumps are not more generally used in irrigation when the service is rendered at such comparatively light cost of installation and operation, is beyond comprehension, particularly when the great increase in productiveness which results therefrom is taken into consideration. It has been suggested that a favorable field for a business enterprise exists in encouraging irrigation by means of electric power through the organization of a company that will install electric pumping plants to be paid for under easy terms out of the guaranteed increased production of the land. That such an enterprise would be profitable is not to be doubted, for while there is so much rain in the upper Sacramento valley, for instance, that farmers and orchardists can raise fair crops without irrigation, this very fact has deterred them from investigating the big profits to be made by irrigating their orchards and fields. Even if they do understand the great benefits to be derived from irrigation, they seem to rest content in the belief that some day some million-dollar company or the government will undertake the great enterprise of building a canal to convey water from the river to their bench lands. This day dream will not be realized for years, and in the meantime their profits are by no means those which would accrue were modern engineering methods impressed in their service. By irrigating by electrical power each small land holder can own an independent irrigation system the cost of which may be accurately determined before its installation, and similarly its profits can be closely predetermined. There is no hazard.

The housewife who reads ads and buys advertised things has the satisfaction of patronizing enterprising and progressive merchants, as well as the satisfaction of saving money—something—on every purchase she makes.

For plenty of other bargains call or address

Closing Out

We have 60 tons of hay; also ten tons of barley. Don't stop at the West Side, but come to the corner of Grape and Eighth. Phone 6402. Residence phone 6941.

A. B. Tull

TALENT Real Estate FOR SALE

Good business opportunities and locations, all paying.

TEDDY'S DAMSITE

Isn't it with our LANDSITE. For instance, a 1000-acre tract containing over 200 acres of the famous Bear creek bottom land, in alfalfa, and extending to the higher land, which is set to orchards in part, all the land being good fruit land.

Some of the land is now in bearing trees and may be purchased at reasonable figures, the alfalfa land with a good stand of alfalfa for \$270 to \$350 per acre; young orchards, good stand, \$250 per acre, and grain land at \$175 per acre.

This is an "ideal" tract for a colony, as it would cut up into small or large places to an advantage, or may be purchased in 10, 12, 20, 40, 50 and 60-acre or any size tracts. Easy terms given at low interest.

Located three miles from Ashland and one mile from Talent, Or.

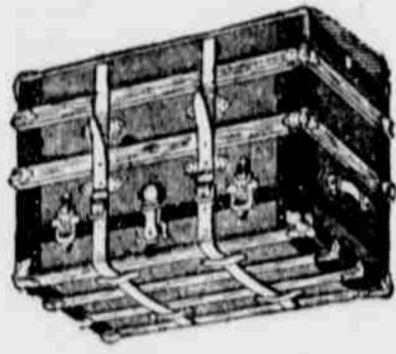
A 74-acre tract 2 1/2 miles West Talent, good 8-room house and large barn; 8 acres under ditch and in alfalfa and garden land; 34 acres under plow, and trees; 20 acres of orchard, of which 5 acres are in bearing; telephone and R. F. D.; half cash, balance good terms and easy payments.

For plenty of other bargains call or address

G. A. Gardner
TALENT, OREGON.

A Showing of 1911 Merchandise

Worthy Your Most Critical Inspection



Give us a look on our
Trunks, Suit Cases and Bags

Leather Suit Cases \$4.00,
\$5.50, \$6.50, \$8.00 and \$10.



Twice the Wear

Kayser's

Patent
Finger-Tipped
Silk Gloves—50c up
We sell Kayser gloves at the price of the poorest. Yet they outwear common gloves twice over. Kayser gloves go through fifty operations to attain the perfection you see. "Kayser" in every hem.

Our Shoe Dept.

is full of the best values to be had. Remember, we handle only the solid leather kind. New lasts, new toes, best materials, best fitters. Try us.

Ladies' Muslin Drawers

of dainty materials, neatly trimmed with lace or embroidery, at 33c, 50c, 60c, 85c and \$1.00.

We are showing an extremely swell line of

Ladies' Suits

in tans, grays, navy, mixtures and blacks.

A dandy pure wool Suit \$11.90
Others \$13.50, \$15.00, \$17.50, \$20.00, \$22.50, \$25.00, \$30.00, \$35.00, \$40.00.

Little Folks and Big Folks Clothing in Abundance

Just received from America's best tailors. Men's Suits of pure wool fabrics, made to fit and hold their shape, \$8.50, \$9.50, \$10.00, \$12.50, \$16.50, \$18.00, \$20.00, \$25.00, \$30.00.

We are handling an extraordinarily high-class line of

Ladies' Undermuslins

cut full measure of the best materials, daintily trimmed and, best of all, moderately priced.



Clothing!
Clothing!!
Clothing!!!

Dry Goods for Less

A beautiful line of India Linon at 7c, 10c, 12 1/2c, 15c, 20c, 25c and 35c.

Best Amoskeag Apron Gingham, 8 1/2c.

Best Prints, 5c.

Draperies, 8 1/2c to 45c.

72x90 Bed Sheets, 49c; others 75c, 85c, 90c.

Ask About Our Profit Sharing Plan

... THE GOLDEN RULE ...

St Marks Block

AKINS, BENTON & CO.