Irrigation by Electric Power

Data Compiled by the California-Oregon Power Company

Owing to the climatic conditions, an artificial means of applying water to growing crops is essential to the highest agricultural development in practically every section of the west. Under careful application irrigation has thus brought forth results on western lands unsurpassed in the world.

Irrigation by pumping with electricity offers more advantages than any other system of irrigation. It has been thoroughly tried and proven successful in every instance. In many districts where ditch water is available pumping plants are being installed because of the convenience and reliability of electric irrigation. Wherever electric power is available for pumping the general prosperity of the irrigators is high and crop failures are unknown.

First cost for each acre put under irrigation is, on most land, cheaper than buying ditch rights. The plant can be located to deliver water at the most favorable point, thus reducing in many instances cost of checking and ditching. The expense of sinking wells is not great, while the pits and buildings required are simple in construction. The pumping and electrical equipment is of the simplest and most reliable.

Cost of operation will compare favorably with any other method of pumping. No attendant is required. The water is delivered at the time it is wanted, avoiding long waits, as is sometimes necessary with ditch irrigation. The quantity of water can easily be regulated by the irrigator.

The type of pumping plant most generally installed is a centrifugal pump belted to an electric motor and set in a pit near the water level. Centrifugal pumps are built in two styles, vertical and horizontal, each meeting certain conditions. A good centrifugal pump will draw water as far as a plunger pump, or about 28 feet. However, it will operate with much less power when set near the water level. For this reason pits are usually dug with the floor at or near the level of the water in the well or stream, when the pump is not running.

The base or bedplate of the pump and motor should be held firmly to the floor by bolts imbedded in the concrete or timber foundation. In digging the pit enough room should be allowed to permit easy access to every part of the pump and motor. A substantial stairway or ladder should lead down in the pit from the ground level. An electric light should be hung in the pit and low enough to light every part of the pump and motor. A beam carried by studding in the house frame, should be over the pit. This should be strong enough, and carried by studding equally strong, that a pulley and rope may be used for lifting out pipe, valves and parts of the pump that may need inspection and repairs. The pump is primed by connecting a small pitcher or suction pump to the top of the pump case or suction elbow. Its connection and method of operation depends on the use of a foot check valve for keeping the pump full of water when not running.

A centrifugal pump consists of a rapidly revolving runner or wheel turning inside a casing. The water is led into the vanes, corresponding to the spokes, at the hub and is thrown outward by centrifugal force. The runner has no rim or tire and the water is thrown into the collection chamber cast in the casting, and surrounding the runner. From here it is carried in suitable piping to the point of use. It is self-evident that the faster the runner revolves, the greater the force with which the water leaves the pump. Likewise, the smoother the sides of the water passages and the fewer turns made in passing through the pump, the less power will be taken up by friction.

Proper sizes of runner and casing and correct shape of the vanes have everything to do with the efficiency or amount of power required. The best way to be sure of getting an efficient pump is to buy of a reputable firm which has had long experience in building pumping machinery. Their designers are, or should be, familiar with the proper relation of runner and casing that gives the best results.

Four general methods of irrigating are in use. For sowed grains, meadows and pastures, water is supplied by flooding, water flowing from one ditch to the next. Land usually needs to be carefully graded if it is to be irrigated by flooding.

For crops planted in rows and for orchards irrigation by furrows is generally preferred.

Instead of either of the above methods, the ground is sometimes laid out in beds which are banked around the sides and flooded.

A fourth method, which has for its object, the reduction of evaporation losses, is by underground pipes of open seam, perforated or tile construction. Water escapes to the ground from the openings in the pipes.

Sub-irrigation meets with the following difficulties:

Loss of water downward through loose gravelly sub-soils.

Failure of water to penetrate laterally for any distance through the majority of soils.

Stoppage of openings by masses of stones, rootlets, etc.

It is advisable to construct reservoirs whenever possible as a small pump can be used to fill the reservoir and the tract to be irrigated flooded in a short time. A reservoir 104 feet square and four feet deep will hold enough water to cover 12 acres one inch deep. Another argument for using a reservoir is that the water is raised in temperature and warm water is better for growing crops than cold water direct from a well or stream.

Distributing ditches or laterals with raised banks are usually placed about 16 or 20 rods apart, distance varying with the soil and the slope and being such that water will flow from one to another without too great a variation in the amount of water taken up by the two sides of the tract. In laterals a fall of about one inch to the 100 feet is good practice. For rapid irrigation the ditches should at all times be capable of holding water to at least four inches above the level of the field.

Truck Gardening

Before setting plants the ground should be thoroughly wet. It is of advantage to irrigate immediately after applying chemical fertilizers rich in nitrogen, as an abundance of water removes danger of injury to the plants from the concentrated fertilizer, also dissolving and distributing the plant food.

It would often be impossible to set plants within a week or more of the desired time if it were necessary to wait for rain to moisten the ground. Furthermore not only at the time of transplanting, but also during the period of growth crops are retarded and withered by lack of rain. In intensive gardening, where prices are regulated by the time when crops should be placed on the market, time saved by application of water when it is needed will show handsome profits for the gardener who has provided an efficient and dependable irrigation system.

From the above it will be seen that the motive power for irrigation pumping should be dependable and available exactly when wanted. The apparatus should also require a minimum amount of repair and attention while operating, for irrigation is usually done at a time when the gardener can least afford to detail a man to attend to the pumps. From these considerations an electric motor is the ideal power.

The California Oregon Power company supplying current to the territory between Grants Pass and Ashland, is making special inducements to users of electric power for irrigation. A rate of $25 per horsepower for the irrigation season not to exceed six months is being offered, which is only 59 mills per hour for 4230 hours and is a cheaper rate per hours use than any other form of power offered.

A number of pumping plants are being installed, especially in the territory between Gold Hill and Grants Pass, where an unlimited supply of water can be pumped from Rogue River.

The company has supplied the following instructions for installing pumps and tables of amount of water pumped:

Important Requirements to be Compiled With When Installing and Starting Centrifugal Pumps.

Place your pump on a proper foundation, line it up thoroughly so that the shaft runs perfectly free without binding. Do not support the suction piping and discharge piping on the pump alone as it is liable to spring the base and other parts of the pump, thereby causing binding and unsuccessful operation.

Make the distance between the driving pulley and the center of the pump sufficient so that it may not be necessary to tighten the belt to excess. Fifteen feet belt centers are rather little, 25 feet belt centers are about ideal and will allow full development of rated power of motor and reduce friction to a minimum.

If short belt centers must be used owing to lack of space increase the width of belt and weight of belt to minimize abnormal friction as much as possible, increase width of pulleys to take the wider and heavier belt, avoid short belt centers if possible.

In packing the stuffing box use Standard Hemp Packing thoroughly soaked in oil and in winding it around the shaft place it so that when the pump shaft revolves the packing will unwind, or in other words, the opposite direction that shaft revolves, shake out the hemp packing and re-braid softly and firmly, but not too firm before packing.

Under all conditions always place a check-valve on discharge end of pump. The valve not only excludes air but protects the pump shell from water hammer, i. e., water rushing back in case of sudden stoppage which may occur, or when shutting down when through operating, the valve will take the blow thus protecting the pump shell from damage in the form of cracking, otherwise the operator must abide by his own accident. Intake and discharge pipes should be of ample size and have as few elbows as possible. Extra elbows make friction which may interfere seriously with the efficiency of the pump.

Ninety-nine times out of a hundred when a pump does not raise water, it is because it is not properly primed, or there is a leak in the suction pipe in joints or through the packing. A pump, in order to prime, must be completely filled with water in all parts, meaning for multiple stage pumps that all the stages should be emptied of air, cocks or valves being provided for such purposes.

Never run your pump dry as this will invariably cause some of the closer fits to seize. As said before, be sure that your pump is thoroughly primed, that the air has been exhausted from all parts of the same otherwise it will not give the full capacity and is liable to cause balancing troubles.

It is needless to say that the bearings must be provided with oil or grease, as the case may be. If an oil cup is emptied at too fast a rate, due to vacuum, adjust the same by reducing the area through which the oil must pass. This refers also to grease cups.

It goes without saying that pumps must operate at the proper speed for the head under which they are to pump. Speed tables in manufacturers' catalogues will give the necessary information and these catalogues give considerable additional information on the operation of pumps which is of importance.

In nearly all cases belted units are to be recommended, as in case a change of speed is desired it is only a question of purchasing a new pulley, which can be done at a small expense.

On all high points of pipe lines automatic air relief valves with saddle flange to take the valves should be provided to allow the free escape of air while pipe is filling and also to present the formation of vacuum by admitting air when water is drawn from the pipe. When filling pipe line the valves will allow the natural freedom of flow of water and protect shell of pump from an extreme heavy back pressure which otherwise would occur, and liable to crack the shell of pump especially in the case of long pipe lines. The valves are positive and entirely automatic, and can be bought in open market.

TABLE SHOWING SIZE AND CAPACITY OF CENTRIFUGAL PUMPS AND AMOUNT OF WATER PUMPED IN FOUR MONTHS

Size of Pump Suction and Discharge.	Gallons per minute.	Number of Miners inches.	No. Acres Pump will cover 1 in. deep every hour.	No. Acres Pump will cover 12 in. deep running 24 hrs. per day for 120 days.	Horse Power required for 1 Ft. lift.	Horse Power required for 50 Ft. lift.
1	20	1.78	.04	9.6	.012	1
1½	50	4.5	.1	26	.026	2
2	100	8.9	.2	53	.05	3
2½	150	13.4	.3	79	.076	4
3	225	20	.5	117	.114	5
3½	300	27	.6	158	.16	7½
4	400	35.7	.9	210	.2	10
5	700	62.5	1.5	370	.34	15
6	900	80	2	480	.460	25
7	1200	107	2.6	624	.62	30
8	1600	143	3.5	850	.82	40
10	3000	268	6.6	1580	1.52	75

Other lifts in proportion.

On account of friction losses in small sized pumps, it is not advisable to use smaller than a One Horse Power Motor in the smaller installations even if the amount of power should figure less than one horse power. In any event the nearest commercial size of motor is the one to use. For example: A four-inch pump, ten foot lift, should be ten times .2 or 2 horse power; a three inch pump, thirty foot lift, would be thirty times .16 or 4.8 horse power—5 horse power would be nearest commercial size.

INFORMATION CARD.

Any one desiring estimate of cost on proposed irrigation plant will receive prompt reply by filling out the following form and mailing to California Oregon Power Company, Medford, Oregon.

Number of acres desired to irrigate..

Total lift in feet from water level of well or stream to highest point of land to irrigate ....

Number of feet of pipe required ....

Number of feet of ditch or flume required ....

Water supply (well or stream) and name of stream ....

Signed ....

P. O. Address ....

Location—Section ....

Township ....

Range ....