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PACIFIC ENGINEER

April
1930

Volume IX

Number 4

A Monthly Journal for Architects and Engineers
Official Publication Professional Engineers of Oregon

The Portland Water Supply

Fifty Years of A. S. M. E.

Who's Who Among Oregon Engineers

Advice About Fire Insurance Policies

An Engineer for County Commissioner

Registration Legislation

TEN CENTS PER COPY

$1.00 PER YEAR

THE PACIFIC ENGINEER

Published Monthly by the
PACIFIC ENGINEER PUBLISHING COMPANY
For the Engineers of the West
76 Official Publication, Professional Engineers of Oregon

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AN ENGINEER FOR COUNTY COMMISSIONER

By O. E. S.

If "a public office is a public trust" as we have been so often told, then the public must be careful to choose for office holders, men it can trust. This means that these men must have ability, as well as honesty, honesty as well as ability, and must have had experience either in the work they are to undertake or along parallel lines.

A. K. Grondahl, republican candidate for county commissioner of Multnomah County, is, I believe, a man who fulfills the above specifications—and to spare. His 27 years of experience in surveys, design, location, construction and maintenance of highways and bridges fit him most thoroughly to look after the taxpayers' interests where the county's expenditures are heaviest and where his careful thought and ripened judgment can get more value for a tax dollar than can any one without similar training.

He has gained much of his experience in the Multnomah County roadmaster's office where he won the commendation of the Board of County Commissioners for the care with which he did his work, resulting in the saving of thousands of dollars on one road job alone.

It has been said that Mr. Grondahl "'is not a politician," and I believe that is true if we use the word "politician" in its usual sense. It is to Mr. Grondahl's credit that this can be said. He can, however, be depended upon to spend full time and the accumulated results of his long experience for the best interests of the county without thought of gain in personal, financial or political influence.

Mr. Grondahl may not be of any special "use" to any special "interests" but he can be depended upon to see, so far as one member of the county board can see, that the best interests of the county as a whole are served.

Mr. Grondahl, who has been a taxpayer in Multnomah County since he was 19 years old, is a native Oregonian. He is a member of the Professional Engineers of Oregon and of the Northwest Society of Highway Engineers. He is delegate from the Professional Engineers of Oregon to Oregon Technical Council and to the Portland Fire Waste Council. He is a member of the Sunnyside Masonic Lodge, a life member of Al Kader Temple, Nobles of the Mystic Shrine; past patron of Eastern Star, a member of Oregon White Shrine and of the Woodmen of the World. He is a 32d degree Scottish Rite Mason.

Engineers have frequently said that the public would be better served if more engineers would volunteer to become elective officers. Here is a splendid opportunity to prove this to be true and to pave the way for a greater service by engineers in the work for which they are so admirably fitted.

Professor E. O. Eastwood, in charge of the newly established Guggenheim School of Aeronautics at the University of Washington, addressed the March 28 meeting of the Oregon section, American Society of Mechanical Engineers on "Engineers of the Air." This meeting also took cognizance of the 50-year anniversary of the A. S. M. E. which is being celebrated all over the country. Prof. S. H. Graf of Oregon State College read a paper commemorating this event.

The next meeting of the Oregon section, A. S. M. E., will be a joint meeting with the student branch at Oregon State College on May 3. This meeting will include some social features and the members are to bring their ladies.

A church bulletin announced: "The women of this church have cast-off clothing of all kinds. Look them over in the church basement any time this week."

Motorist: "Is it very far to the next town?"

Native: "Well, it seems further'n it is, but it ain't."

"Has your husband any hobbies?" asked the neighbor.

"No," said Mrs. Neurich. "He has rheumatism a good deal, and hives now and then, but he ain't never had no hobbies."

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THE PORTLAND WATER SUPPLY

By CHAS. E. OLIVER

The first public water supply for the city of Portland was established in 1857 by Stephen Coffin and Finice Caruthers. The plant was a very primitive affair. The supply main as well as the distribution mains were round fir logs with 2½-inch holes bored through them. The water was brought from Caruthers Creek in the southwest portion of the city.

In 1859 Coffin and Caruthers sold the plant to Robert Pentland; Mr. Pentland operated the plant until 1862 when, having met with financial reverses, he sold the plant to H. D. Green and H. C. Leonard for the sum of $5400.

In September, 1862, The Portland Water Company was incorporated by H. D. Green, John Green and H. C. Leonard with a capital stock of $50,000.

In addition to the supply from Caruthers Creek, a well was dug and a pump installed at the foot of Market Street. This pump had a capacity of 300,000 gallons in 24 hours. The water from both the pump and Caruthers Creek was discharged into a reservoir at Fourth and Market Streets. Shortly after installing the pump an additional supply was brought in from Balch Creek.

A timber dam was built across the creek at a point which is now in Macleay Park and a 6-inch cast iron main was laid to the city. This main supplied the "high service," and the pump and Caruthers Creek supplied the "low service" districts of the city.

In 1868, the city having outgrown the water plant, a new pumping station was built on the river bank at the foot of Lincoln Street and a pump of 800,000 gallons a day capacity installed. This station was again enlarged in 1871 and another pump of one million gallons a day was installed.

In 1876, a new building was erected at the foot of Lincoln Street and another pump installed. This pump had a capacity of three million gallons per day.

These pumps with Caruthers Creek and Balch Creek constituted the city's supply until 1883 when the company built the Palatine Hill pumping station, installed two pumps of a combined capacity of 16 million gallons per day, and laid a 30-inch main to the two million gallon reservoir at 6th and Lincoln Streets. When this work was completed the pumps at the foot of Lincoln Street were shut down and the Caruthers Creek pipe was abandoned. The Balch Creek pipe was continued in service until several years later.

In 1885 the state legislature passed an act creating "The Water Committee" of the city of Portland, and appointed as such committee the following named residents of the city: John Gates, Henry Failing, L. Fleischner, J. Loewenberg, L. Therkelsen, F. C. Smith, W. S. Ladd, H. W. Corbett, S. G. Reed, T. M. Richardson, C. H. Lewis, F. Dekum, W. K. Smith, R. B. Knapp and A. H. Johnson.

After organization the committee proceeded to select an engineer to examine sources of supply and make estimates of costs for a gravity supply system for the city. After corresponding with several parties, Mr. Isaac W. Smith was chosen as engineer.

Investigations were made of Oswego Lake, Crystal Springs, Clackamas River, Eagle Creek and Bull Run River. The latter was decided to be an ideal source of supply.

Early in 1886, Col. Smith, the engineer, was authorized to make surveys and estimates for a gravity supply from Bull Run. Several preliminary lines were run and finally a suitable route was found, location made, plans, profiles and estimates made, rights of way and riparian rights bought and contracts even let for building an intake canal at the headworks, also for a road from the present town of Bull Run to the headworks.

Early in 1887 the water committee purchased the plant from the Portland Water Company, paying therefor $464,551, the appraised valuation.

In January, 1887, the legislature was asked to pass an act authorizing the committee to issue bonds so as to prosecute the work on the Bull Run project as it was desired to eliminate the expensive pumping system as well as to secure for the city a better quality of water. The act was passed all right, but the governor vetoed it and it failed to pass over the veto. This held the Bull Run project in abeyance until a change in administration.

In the meantime the population of the city was increasing so rapidly that a serious shortage of water was threatened, and in 1889 the engineer was ordered to proceed immediately to construct another pipe line to Palatine Hill and to install additional pumps. The contracts were let for this work late in 1889 and the work was completed early the following year.

The legislature at its session in 1891 authorized a bond issue of $2,500,000 for the purpose of bringing in a gravity supply from Bull Run River. Preliminary work was at once begun, rights of way bought, roads and bridges built, rights of way cleared, plans and estimates made and contracts let for the pipe line. Four reservoirs were built by day labor, by the city. The pipe line and reservoirs were completed in the latter part of December, 1894, and Bull Run water was turned into the city mains on January 1, 1895.

Those who have investigated concede that Portland has as good, if not better water, than any city of equal size in the world, and it will continue good so long as the source of supply is protected as it is at present. The Bull Run River and all of its tributaries above the present intake at the headworks is within the boundaries of the Bull Run reserve.

The Bull Run reserve was set aside as a reserve to protect Portland's water supply in 1892 by President Harrison. It is further protected by an act of congress passed in 1913. This act prohibits all persons other than government employes in discharge of their duties, to enter the reserve. The act also prohibits the grazing of stock, building of roads, cutting of timber and settlements of any kind within the reserve.

The reserve is well guarded during the dry season and all persons without a special permit are warned to keep out. All persons found trespassing are arrested and prosecuted by the federal authorities.

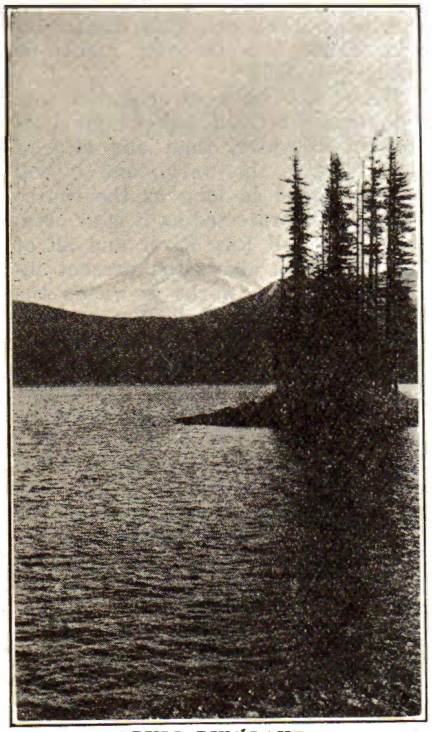
The Bull Run reserve contains 222 square miles and the land, with the exception of a few small parcels, is owned by the city of Portland and the U. S. government.

The larger portion of the reserve is covered by a dense growth of timber and brush and it is to protect this growth that such rigid rules are enforced. The timber and brush retards the melting snow and allows the water to run off gradually. Should the land be denuded of its covering of brush, timber and moss, the source of supply would soon dry up and our splendid water supply would be a thing of the past.

The maximum flow of Bull Run

River at the headworks is 20,000 cubic feet per second and the minimum flow is 72 cubic feet per second; however, the minimum flow is seldom reached.

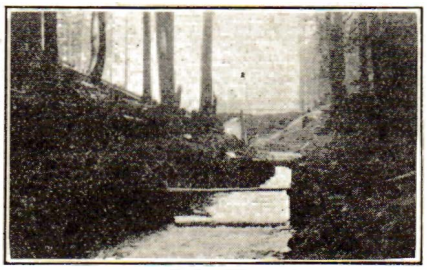
The main tributaries of Bull Run River are Bear Creek, Cougar Creek, North Fork of Bull Run Falls Creek and Log Creek, coming in from the north side, and the South Fork, Trout Creek, Camp Creek and Blazed Alder Creek, coming in from the south side. The source of the main stream is Bull Run Lake, a beautiful body of water situated near the summit of the Cascade Mountains and about five miles northwest from the foot of Mount Hood. The water surface of the lake is 3174 feet above sea level. The lake is oblong in shape and is 1¾ miles long and ¾ mile wide and is very deep. The bottom of the lake is composed of broken stone and boulders.



BULL RUN LAKE

There is no swampy or marshy ground in or around the margin of the lake and there is in many places not enough sediment in the bottom of the lake to seal the interstices between the broken stone. This condition caused many leaks through the bottom of the lake, especially at the western end.

During high water in the lake, in the early summer, there was some overflow at the southwest end of the lake, but the excessive leakage through the bottom of the lake reduced this overflow to a minimum. The largest and most numerous leaks were found to exist in the bottom of two arms in the northwesterly portion of the lake. The area covered by the leaks was found to be so extensive that it was considered to be impracticable to attempt to stop them by covering them with earth. After a thorough survey of the situation it was decided to build a dyke across both arms of the lake, leaving the major portion of the leaks on the outside of the dyke. This dyke, several hundred feet in length, has been



DAM AT OUTLET OF LAKE

completed and has fully accomplished the result desired. In addition to the dyke, several thousand yards of earth and small stone have been dumped in the bottom of the lake at various points where leaks were known to exist. In this way the most of the leaks inside the dyke have been stopped.

A dam with gates for the control of the flow of water has been constructed across the old overflow channel. This dam raises the water ten feet above the bottom of the old channel and about thirty feet above the old low water level in the lake.

The water available for city use, impounded in the Bull Run storage basin, is in excess of ten thousand acre feet, or more than three billion gallons.

When the gate in the dam at the lake is opened the escaping water flows down the canyon about six hundred feet to a basin entirely surrounded by hills. Here it disappears and does not flow on the surface again for a distance of over one mile and at a point 104 feet lower than the basin where it starts on its sub-

MEASURING WEIR ON BULL RUN

terranean trip. From here it runs in open channel for about one-half mile and gradually disappears through the gravel. It comes out again at a point about ¾ mile further along and at an elevation of 425 feet lower than the water surface in the lake. From here the water runs in open channel to the headworks, twenty miles further down.

Contrary to the belief of the majority, there is no glacial or snow water from Mount Hood flowing into the lake. The configuration of the intervening territory is such as to render this impossible.

The origin of Bull Run Lake is very succinctly described by Mr. Ira A. Williams, geologist, Oregon Bureau of Mines and Geology, as follows:

"Bull Run Lake is located in the bottom of a depression that was formerly occupied and largely formed by a glacier during the glacial period. The ice came through the V shaped gap at the head of the lake and extended, and at present unknown distance down the canyon of Bull Run River.

"Bull Run Lake is to be classified as a glacial lake. Its formation resulted from the deposition of impervious glacial materials against the uphill front of a body of volcanic lava that came out of a series of flows in the bottom of the Bull Run canyon in glacial times. This glacial apron sealed the openings into the broken lava to an extent sufficient to cause the drainage waters to accumulate as a lake with this barrier as its lower shore."

Since the completion of the new dam and storage basin on the main Bull Run River five miles above the present intake, Bull Run Lake will be drawn on only at the lowest stage of water in the river.

The first conduit from the headworks on Bull Run River to the city consists of 10 miles of 42-inch riveted steel pipe, 8 miles of 35-inch riveted steel pipe and 6 miles of 33-inch riveted steel pipe—24 miles in all. This brings the water to the reservoir at Mt. Tabor, and from the Mt. Tabor reservoir to the reservoirs in the City Park, at the head of Jefferson Street, 6 miles of 32-inch cast iron pipe was laid, making a total of 30 miles of pipe. This conduit has a capacity of 25,000,000 gallons in 24 hours.

In 1910 a contract was let for a second conduit from the headworks to Mt. Tabor reservoir, 24 miles. This conduit is of lock bar steel pipe and consists of 10 miles of 52-inch pipe and 14 miles of 44-inch pipe and has a capacity of 50,000,000 gallons in 24 hours.

In 1923 a contract was let for a third conduit from the headworks to Mt. Tabor. This conduit is of lock bar steel pipe and consists of 10 miles of 58-inch pipe and 15 miles of 50-inch pipe and has a carrying capacity of approximately 75,000,000 gallons in 24 hours. The three conduits now

in use have a combined capacity of about 150,000,000 gallons in 24 hours.

Coincident with the laying of the first conduit, four reservoirs were constructed in the city for storage of water, one on the south slope of Mt. Tabor at an elevation of 411 feet with a capacity of 12,000,000 gallons; one at 60th and Division Streets at an elevation of 229 feet with a capacity of 20,500,000 gallons; one in Washington Park at the head of Madison Street with an elevation of 300 feet and a capacity of 16,500,000 gallons, and one at the head of Jefferson Street at an elevation of 229 feet with a capacity of 17,600,000 gallons; total capacity of the four reservoirs, 66,-500,000 gallons. At the time of letting the contract for the second pipe line, contracts were also awarded for two additional reservoirs at Mount Tabor—one at an elevation of 411 feet with a capacity of 50,000,000 gallons, and one at an elevation of 305 feet with a capacity of 75,000,000 gallons. This gives the city storage facilities in the six large reservoirs for 190,-500,000 gallons.

In addition to the above large storage reservoirs, there are several small reservoirs, tanks and stand pipes in various portions of the city as follows:

Portland Heights, reservoir, capacity 500,000 gallons.

Vernon, steel stand pipe, elevation 362.39 feet, capacity 1,000,000 gallons.

Burlingame, steel stand pipe, elevation 635 feet, capacity 114,800 gallons.

Council Crest, steel stand pipe, elevation 1096.5 feet, capacity 60,000 gallons.

St. Johns, steel stand pipe, elevation 246.75 feet, capacity 360,000 gallons.

Marquam Hill, stand pipe, elevation 737 feet, capacity 287,000 gallons.

Total capacity of stand pipes, 2,-321,800 gallons.

There are small reservoirs and tanks with elevations and capacities as follows:

Kings Heights, concrete tank, elevation 865 feet, capacity 200,000 gallons.

Mount Tabor, concrete tank, elevation 590 feet, capacity 200,000 gallons.

Portland Heights, concrete tank, elevation 865 feet, capacity 600,000 gallons.

Willamette Heights, concrete tank, elevation 445.62 feet, capacity 60,000 gallons.

South Portland, concrete tank, elevation 475 feet, capacity 60,000 gallons.

Upper Linnton, concrete tank, elevation 538.9 feet, capacity 130,000 gallons.

Lower Linnton, concrete tank, elevation 192.9 feet, capacity 130,000 gallons.

Upper Whitwood, concrete tank, elevation 566.7 feet, capacity 130,000 gallons.

Lower Whitwood, concrete tank, elevation 192.1 feet, capacity 130,000 gallons.

Upper Willbridge, concrete tank, elevation 768.3 feet, capacity 65,000 gallons.

Lower Willbridge, concrete tank, elevation 189.9 feet, capacity 130,000 gallons.

Total capacity of small reservoirs or tanks, 1,865,000 gallons.

Total storage capacity of all reservoirs, tanks and stand pipes in the city, 194,686,000 gallons.

There are several pumps in different portions of the city used for forcing water from reservoirs and tanks to higher levels. At the City Park there are two hydraulic pumps with a combined capacity of 1,500,000 gallons in 24 hours; also three electric pumps with a combined capacity of 2,500,000 gallons in 24 hours. At Council Crest there are two automatic electric pumps with a combined capacity of 750,000 gallons in 24 hours. At Fulton there are two automatic electric pumps with a combined capacity of 1,150,000 gallons in 24 hours. At 60th and Division Streets there is one hydraulic pump with a capacity of 216,000 gallons in 24 hours. At Linnton there is one automatic electric pump with a capacity of 108,000 gallons in 24 hours, and at Whitwood there is one automatic electric pump with a capacity of 108,000 gallons in 24 hours.

On November 20, 1929, there were 86,447 service connections to the water mains belonging to the city. Of this total, 1642 are outside the city limits.

In addition to these there are 46,299 water consumers outside the city who are supplied with Bull Run water by private companies.

On November 30, 1929, there were 1129.239 miles of water mains belonging to the city, in use as follows:

805.34	miles of cast iron mains
6.53	miles of wooden mains
296.632	miles of galvanized steel mains
20.737	miles of black steel mains
1129.239	miles of mains belonging to the city

In addition to the above there were 48.851 miles of mains owned by private companies in use, making a total of 1178.19 miles of water mains in use.

The estimated population within the city limits on November 30, 1929, was	364,644
Estimated population on city owned mains	371,836
Gallons consumed during year	13,002,555,836
Gallons passed through meters	9,956,605,456
Percentage of services metered	100
Average daily consumption	35,623,432
Gallons per day for each inhabitant	95.80
Gallons per day for each tap	419.60

The consumption of water outside the city limits, exclusive of those supplied from city mains, was as follows:

Estimated poplation supplied	46,299
Gallons consumption per year	674,764,068
Gallons average daily consumption	1,848,668
Gallons per day to each inhabitant	39.93
Gallons per day to each tap	174.89
Percentage of total consumption	4.93

Summary

Total estimated population supplied	418,135
Total consumption, gallons per year	13,680,866,395
Total gallons average consumption per day	37,481,826

Since the purchase of the water system by the city the consumers' rates have been reduced several times and the people now pay only about one-sixth as much for water as they did under private ownership.

During the first year after the city took over the water system, the total receipts were $97,500, and during the fiscal year ending November 30, 1926, the receipts were in excess of $1,358,-112.

In 1887 the water committee, before making a final decision on the water supply from Bull Run River, employed Falkman and Reese, state chemists of California, to make an analysis of the water and they reported as follows:

Total fixed ingredients, 2.7 parts in 100,000 by weight or 1.80 grains per imperial gallon (10 lbs. avoirdupois) consisting of:

Silica, parts in 100,000, 0.56, or grains per imperial gallon, 0.392.

Oxides of iron, etc., parts in 100,-000, 0.08, or grains per imperial gallon, 0.056.

Calcium carbonate, parts in 100,000, 0.39, or grains per imperial gallon, 0.273.

Magnesium, parts in 100,000, 0.27, or grains per imperial gallon, 0.189.

Chlorides sulphates, etc., parts in 100,000, 0.40, or grains per imperial gallon, 0.200.

Organic matter, parts in 100,000, 1.00, or grains per imperial gallon, 0.700.

And they say in conclusion that, "To sum up, the water ranks among the best on record and is excellently adapted for domestic use."

Later they had Mr. William Huntly Hampton of Portland make an analy-

sis of water taken from the stream after a sudden rise, and he corroborated the statement of Falkman and Reese that he found the water to be very pure and in every way suitable for domestic purposes.

On July 6, 1891, East Portland was annexed to the city of Portland, but the East Side Water Works was operated by the common council of the city of Portland entirely independent of the water committee, until March 1, 1895, when it was transferred to the water committee in accordance with an act of the legislature directing the same.

At the time of the transfer, water was being pumped from wells near East 11th and Powell Streets, but shortly after the system was connected with the city mains, Bull Run water turned on and the pumps discontinued.

On January 13, 1897, the plant of the East Portland Water Company, owned by H. D. McGuire and others, was purchased by the water committee, the price paid being $45,000. This company pumped water from a large spring at East 12th and Hawthorne Avenue.

On September 30, 1899, the Portland Heights Water Company's plant was purchased for $9700. This company was composed of Portland Heights residents. Water was pumped from the city main at Chapman and Mill Streets.

On January 7, 1902, the plant of the Albina Light and Water Company was purchased for $200,000. This plant was owned and operated by Geo. W. Bates and others and pumped water from wells at the foot of Russell Street.

On February 8, 1907, the plant of the Mt. Tabor Water Company was bought for $25,000. This plant was owned by J. M. Arthur and others and pumped water from springs near East 58th Street and Hawthorne Avenue.

On June 12, 1907, the plant of the Piedmont Water Company was bought for $20,000. This plant was owned by E. Quackenbush and others. The water was pumped from wells.

On September 16, 1907, the Woodlawn Water Company was bought for $4000. This plant was owned by H. and T. Kubic and water was supplied from a well.

On June 22, 1911, the plant of the Woodmere Water Company was bought from Geo. W. Brown and others for $50,191. This plant also pumped water from wells.

On January 3, 1912, the plant of the Woodstock Water Company was bought from D. B. Fleck for $20,716. Water was pumped from wells.

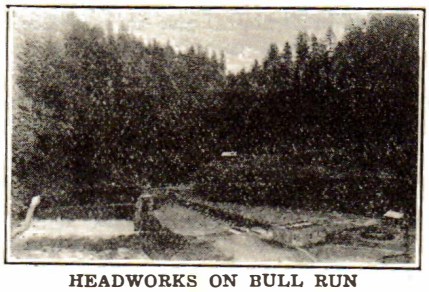
On January 3, 1912, the Metzger system was bought from Herman Metzger for $652.15.

On July 7, 1915, the city of Portland took over the town of Linnton by annexation. The town had issued $150,000 bonds for water works purposes. After annexation these bonds became a part of the obligations of the water bureau.

In March, 1916, the water bureau received title to the St. Johns Water Works and Lighting Company's plant. This plant was owned and operated by P. H. Edlefsen and others; the purchase price was $108,000.

The city now owns all of the water systems within the corporate limits.

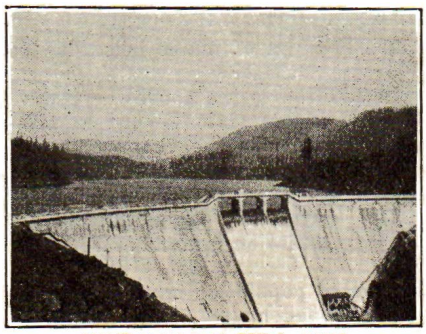
There are many consumers outside the city who are supplied with Bull Run water by companies operating private plants, the water being supplied to them by the city through meters.



HEADWORKS ON BULL RUN

During 1921 and 1922 new headworks were constructed on Bull Run River. A monolithic concrete dam 30 feet in height was constructed across the stream, sluice gates put in and a diversion canal several hundred feet in length built, also a concrete screen house and power house built. The screen house is fitted with link belt rotary screens operated by electricity.

The power house is fitted with two generators, one of 4 kilowatt capacity and one 17½ kilowatt capacity. This plant not only operates the screens but furnishes light for all the dwellings, garages and buildings at the headworks, as well as the roads and walks in the immediate vicinity. The power plant is operated by water power, and the cost of operation is nominal.



NEW DAM ON BULL RUN

An additional storage reservoir has been constructed on Bull Run River five miles above the present intake. This will store a portion of the spring runoff which has heretofore run to waste.

This storage reservoir will impound approximately 11,000,000,000 gallons of water and will be sufficient to augment the low water stream flow for many years.

The water bureau has also purchased a large tract of land adjacent to the city, most of which will be used for a series of large reservoirs.

These reservoirs will be at sufficient elevation to maintain an uninterrupted supply to all other reservoirs in the city as well as to supply water by gravity to a large portion of the higher districts now supplied by pumping.

REGISTRATION LEGISLATION

Some of the registered professional engineers in Oregon are not entirely satisfied with the present registration law. A few want it amended in one way, others have a different idea as to its shortcomings. The time is fast drawing near when some, if not all, of the points under discussion can be made right if the engineers who are interested can agree on what they want, and ask for it in time to give the legislature time to act.

Realizing that the time for action is near, the legislative committee of Professional Engineers of Oregon is receiving suggestions in writing from members of the society. The committee hopes to digest these suggestions and formulate a workable amendment to the present act before the legislature meets.

Will you not do your part by reading over the act and then writing a letter to the **Legislative Committee, Professional Engineers of Oregon, Lobby of Multnomah Hotel, Portland, Portland, Oregon, embodying your suggestions?**

If you think the act is as good as is possible for such a law to be, say so to the committee. If you want the yearly fee increased, the committee wants to know how much and why. If any other suggestion for bettering the status of professional engineers occurs to you, write to the committee.

Don't wait until you have evolved a perfect bill out of your own inner consciousness. Admitting that you can do such a thing, it is fair to the rest of us? Just do your share. Write what occurs to you right now, and when you have another bright idea, send that in before it fades away.

Remember that this committee wishes to serve you, but it can't do its best unless you do your share.

Do not delay—

Write right now.