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the engineers estimate can be prolitably expended on the improvement work of the rivers during the fiscal year ending

Major James C. Post is at the present time the government engineer in charge of all the river and harbor improvements

in this district. It is due to the courteny of Major Post that The Oregonian has been enabled to obtain much of the data

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June 30, 1896.

THE PORT OF PORTLAND

Improvements Made in the Willamette and Columbia Rivers.

WIDE AND DEEP CHANNEL OPEN TO THE SEA

Prestige of Portland as a Fresh Water Seaport-The Vast Shipping Interests.

THE BIG JETTY AT THE MOUTH OF THE COLUMBIA RIVER

Inauguration of Work on the System of River Improvementa-Satisfactory Results Already Obtained-Money Spent by Portland and the National Government.

river and harbor imbeen followed by more successful re-sults than the one made by the Port of Portland commission

United States engineer corps, is as easily reached by vessels of deep draft as is the wide and deep estuary of San Fran-When it is stated that a wide and deep channel is now maintained from Portland to the sea without difficulty at even the lowest stages of water, the impurlance of the Columbia and Willamette rivers as an open highway can be fully appreciated, and the class of vessels that now regularly frequent this port establishes Portland's claim as one of the lead-

ing scaport cilles of the coast. The work of the government in structing a jetty at the mouth of the Co lumbia river, a work which is fully de-scribed in a subsequent part of this ar-ticle, has resulted in making a perfectly straight channel through the entrance of mean depth of 31 feet at the lowest tide. Tessels easily enter this channel and sail into the harbor at Astoria without the aid of tugs, and the regular lines of steam ships which ply between Portland and Sar Francisco run practically on railroad time between the two ports throughout the year. Within the past two years Portland has been visited by the Baltimore and I harfeston, two of the largest cruisers of the United States navy, and it is not an uncommon sight to see a four-mosted ship unchored in the river in front of the city's docks. At the lowest stages of water ships of from 2500 to 2700 tons register are

between Portland and the sea is fully assured, and with the advantages of a fresh water harbor within easy communicating distance of the great producing areas of the Pacific Northwest, Portland's as a seaport will never be

the Willamette and Columbia rivers ex-tends back over a period of 30 years. The suggitution of work on the i

the engineers down the coast as far as Tillarmook head and Necanicum creek, and inland toward Lewis & Clarke river and other directions. The results of these umerous examinations were not satis-actory. Good rock was found at Tilla-nok head and near Lewis & Clarke river, but the first cost of building a line of rall-road to these quarries was great, and such a line could only be operated on an safety expensive basis. The attempt to secure land delivery of rock was finally aban-doned and recourse was once more had to

delivery by barges. The third appropriation for the prosecu-tion of this work was made in August, 1888. The total amount of money approprinted for building the jetty up to that time was \$257,500, which was spent in four years, or at the rate of about \$70,000 a year. With such limited appropriations the progress of the work was necessarily slow, but better headway was made than even the engineers had hoped for. The amount of the appropriation of August, 1888, was \$500,000. After that time ample funds were provided for carrying on the work without intersection under the angle of the stress.

ption until April 1 of last year, when work was entirely suspended only to be resumed on August 20 following. The total amount appropriated since August, 1888, for this work has been \$1,735,000, an average of about \$250,000 a year. This includes the \$500,000 appropriation mentioned

After the first big appropriation of \$506,-500 was made, the plant for building the jetty was greatly improved. The govern-ment steamer Cascades was repaired and effort in the line of to any great harbor on either the Pacific iver and harbor im- or Atlantic coast line of the United States. put to work towing rock barges between the quarry and Astoria. A first-class steam tag, the George H. Mendell, was built to tow the barges from Astoria down In December, 1887, a memorial was sent to congress by the Astoria chamber of commerce, stating that a number of ships ware lying inside the mouth of the Co-lumbia awalting a favorable opportunity built to tow the barges from Astoria down to the jetty. The number of rock barges was increased to 10, the equipment of loco-motives to five, and the number of dump cars to 62. A work shop 30x100 feet was built and equipped, and in this shop was constructed all the rolling stock for the to go to sea. The memorial conveyed the additional information that four of these ships had already been detained at Asto-ria for over a month, watching for favor-able winds and tides which would allow constructed an intro toding succe in the work, except the locomotives and the dump car and flat car used in the con-struction of the jetty at Coos bay. All the repairs of the extensive plant at the jetty have also been done in this shop. them to cross out over the bar safely, and that such delays were not unusual for vessels of a draft of 20 feet and over.

made by the board of United States en-gineers who had visited the mouth of the Columbia river in the fall of that year, In conformity with an act of congress This memorial followed the inspection



thus allowing the work to be handled in the most ecoponical manner possible. The materials for the jetty have been carried along the line of the work as con-struction progressed, on a transway sup-perted on piles. This transway was built bout 28 feet above the level of low tide. on this transvay was built a double track of a three-foot gauge road, the tracks being 15 feet above the centers. The trans-way, it wants to be explained, is only a temporary structure, and was to be used only for the transportation of materials of construction along the line of the pro-

HOW IT 15 CONSTRUCTED. Transporting the Material Out Along

throughout its entire length This consists of two classes

of mats, center and side, each 20 feet wide and placed close

together. All the mats were constructed of fir or willow

brush, the center mats being

generally five feet thick and

rectly under the tramway

constructed cars provided with

The side mats were

safety. In the early part of 1883 a board of en-sineers was appointed for the purpose of considering the results obtained and the inter was appointed for the purpose of considering the results obtained and the importance of data collected from the construction of the work, and to report upon the matter of the completion of the enterprise. The board made its report under date of May 37 of that year. It recommended that to give greater permaacres

thence to four feet above low water at the outer end. The above recommendations were ap-proved, and the work is now being carried to its final completion in accordance with this report of the engineers. The neces ary money to finish the work was appro-priated in the last river and harbor bill. The four low groins are now practically completed. More than 2½ miles of the jetty from its outer and inshore has been raised to the required height, and about 70,000 tons of rock will suffice to complete the remaining part of the work. In connection with work on the jetty 300 feet of shore revenent will be con-structed, this being a continuation of the jetty, running up stream above the

jetty, running up stream above the wharves and towards the eastern limit of the reservation. The estimated cost of this revetment is about \$50,000. It is expected that after the final completion of the jetty work there will remain on hand an unexpended balance of about \$70,000

from the appropriations made by congress. The total cost of the completed jetty, in-cluding this \$70,000, will then have been \$2,025,680, the total amount appropriated. This is \$1,684,220 less than the original estimate of the cost of a low-tide jetty at this point.

In the construction of the tramway ou over the jetty there were used over 400.00 lineal feet of piling and nearly 3,000.00 feet of timber. In the mattress work and ns were used 22,000 feet of brush fas-s. The amount of rock received from all sources since the commencement of the work in 1885 has been about 750,000 tons, and it is estimated that it will require about 120,000 tons more to complete the work.

The cost of the tramway per lineal foot was about \$5. This includes all cost of re-pairs and of putting the mattress work in luce. The cost of this mattress was bout \$5 a cord.

The contract price of the rock delivered aboard the government barges at the guarry has varied from 80 cents per ton to 48 cents a ton, the latter price being the smount paid at the crient time. This rock has been placed in the jatty for less than \$1 is a ton. This includes the first cost of the rock, towing, handling and repairs to the plant, but the cost of the plant. itself is not taken into account. The average cost of towing the rock from the quarry to the jetty and returning the empty harges has been less than Il cents a ton. This is not figured on the basis of the cost of the plant, but it does allow for repairs and all incidental expenses of aintenance

The work on the jetty has all been done by hired labor, with the plant owned by the government, and with materials pur-chased by contract in the open market. the Jetty. HE mattress work of the jetty throughout its entire length. This cortainly appears to be the most ad-vantageous and practical method of car-rying on great public works of this char-acter. It is of advantage to the govern-ment, and it effects a saving where ample funds for prosecuting the work are pro-vided over the old methods, permits the work to progress rapidly and insures more perfect control of operations. During the time work has been pushed on the jetty it has been necessary to suspend operations for about six weeks each year on account of inclement weather, 64 feet long, and the side mats 2½ feet thick and 20 feet long. The center mats were built diand to permit a thorough repairing of the extensive plant for the active resumption of work in the early spring. The jetty has ment when a plan for coast defenses has been fully outlined. tracks upon a grillage of poles, suspended by means of stened to the stringers of now for several years past successfully withstood the most violent storms, and though the seas at times would run nearly Improvement of the River Channe as high as the tracks of the tramway, no damage has been done to the jetty, ex cept the washing away of a portion of th top rocks on the last half mile of the work. During the storms of the winter of 1883-94 about 2000 feet of the track near the outer end of the tramway were swept

results. The currents had been prevented by this work from washing away the sand in the vicinity of the jetty, and this sand had been more largely diverted to places where it would tend to produce the results almed for by the engineers. The engin-eers had every reason to believe that if this process could be continued, the in-creased necumulations of sand on both sides of the jetty would add greatly to its safety.

Gregonian.

offe-main mile in which and containing very like acres, there had been an average fill of 43_2 fect, or something over 10,000,000 cubic yards of sand. The fill was greatest near the jetty. The sands bare at low tide on this side of the jetty covered 257

The outer end. The shore at 18 miles out, and the feet of the jetty content at the outer end.

sand. The spit on the south side of the jetty has greatly increased in area, and large portions of it are now nearly seven feet above low water. The sand has filled close up to the jetty, and in places it entirely covers the rocks. On the north side ments, the recommendation went on to the results have been equally as satis-factory. The deposit of sand accumulated jettles, to be placed in the river at places on both sides of the jetty amounts to one-third of the total accumulations here at

third of the total accumulations here at the present time. At low tide it is now possible to walk on the bure sands from a point about one mile from the foot of the jetty to a point near its extreme end. This accumulation

ceding, made the amount available for this work for the fiscal year ending June 30, 1855, \$54,725. The estimated amount re-quired for the completion of the work of improving these rivers as now planned, a work that will insure a depth of 25 feet from Portland to the sea at the lowest stages of water, is \$156,130. This amount

of sand is constantly going on year by year, thus greatly strengthening the jetty, and the engineers believe that the per-depth of 20 feet of water at the low manency of the improvement is now as-stages of the river from Portland to the

erament's policy of attempting to main tain a channel from Portland to the sea In 1957, as stated in this report, it was estimated that the removal of 50,000 cubic yards of material from what was known as Swan island bar would insure a chan nel through these shoals of a depth of 18 feet, and 100 feet in width. Up to 1851 fully 250,000 cubic yards of material had been removed from this bar by the United

for the present article. Major Thomas H. Handbury was in charge of this dis-trict till November 20, 180, when Lieu-tenant Harry Taylor assumed temporary charge, a responsibility he held until he was relieved by Major Post, on Feb-ruary 19 last. Colonel G. H. Mondell, of the army corps, is division engineer of this district. Appropriations made by the national government for the improvement of the Willamette and Columbia rivers, between Portland and the sea, exclusive of the sums appropriated for the construction

of the jetty at the mouth of the Columbia. are as fol June 23, 1866 (lower Willamette)..\$

money was spent in this way to have secured a permanent channel of good depth from Portland to Astoria. The government engineers had for years recommended a line of permanent im-provements in the river. These improveof advantage, with the view of confining the flow in the river to narrow channels

What the Efforts of This Commission Have Accomplished. BOUT the middle of August, 1890, the Union Pacific Railroad Company, which conducted at that time most of the tow-

PORT OF PORTLAND.

rch 2, 1967. 19 25, 1968 (allotted)... ril 10, 1969 (allotted). 19 11, 1869. ne 10, 1879.

1873

June 23, 1874. March 3, 1875

August 14, 1876. June 15, 1878... March 3, 1879... June 14, 1880...

August 2, 1882..... July 5, 1884..... August 5, 1884..... August 11, 1888..... August 11, 1888.....

July 13, 1892..... August 17, 1894....

ing and lightering business on the lower Willamette and Columbia rivers, began to refuse to take vessels drawing more than 1815 feet of water from the Portland docks for Astoria. The principal ob-struction in the river chan-

20,000 21,000 21,000 20,000 20,000 20,000 20,000 20,000 20,000 20,000 20,000 45,000 45,000 100,000 100,000 100,000 100,000 20,000 50,000

struction in the river chan-nel at that time was at Swan island bar. The last government appropriation had been exhausted and there were no availa-ble funds from which to provide for improvements to the river channel between Portland and Astoria.

In this crisis the Portland Chamber of Commerce was aroused to action. The chamber borrowed the city dredge and proceeded to cut a channel through Swan island bar. This work was prosecuted vigorously for a period of two months under the supervision of the chamber. who hore all the expense of operating the dredge. The amount of material dredged out of the channel on this bar w.s 21,500 cubic yards, and this resulted in opening a channel through the bar, which would float vessels of any draft that visited this port.

The people of Portland were thus brought to realize the importance of se-uring and maintaining a channel of good lepth between this city and Astoria. They realized further that if such a chan-nel was to be secured within a reasonable length of time the expense of making it must be borne by the city. A bill was introduced in the following session of the egislature which authorized the incorpo ration of the commission known as the Port of Portland. This bill was pas without any important modifications : ns and it became a law on February 18, 1891.

Following the passage of the act came the question of its constitutionality. A



diate relief to shipping. Between 1877 and 1891 congress appro priated \$540,000 for the work of improving

at the entrance to the straits of Fuca is about 70 miles. The Columbia river is the only harbor of the first magnitude on the entire coast between San Fran-cisco and Cape Flattery. The opening of the Columbia river to vessels of the greatest draft makes this river an available harbor of refuge for all vessels seeking a port. In case of war this harbor would be a most impor-tant pedie of rendezous for an enemy's tant point of rendezous for an enemy's fleet. From here an enemy with a strong fleet might strike Portland (if he could

STEAM DREDGE W. S. LADD. sured, and that the depth of water in the sea. The plan of improvements contem

sured, and that the depin of water in the channel over the entrance will never be less than it is today. There are now but three great harbors on the Paulic coast. These are at San Franciaco, the mouth of the Columbia river and Puget sound. The distance be-tween San Francisco and Cape Flattery at the entrance to the straits of Fuca is about 70 miles. The Columbia river is

the Willamette and Columbia rivers be-low Portland. Numerous bank revelments were constructed, sloughs and aux-

iliary channels were closed, dikes and jetties were erected at various places where needed along the rivers. In the Willamette river, dikes were constructed across the head of Swan island chute, at the head of Willamette slough, to con-

to secure a channel from Portland to the sea, a distance of more than 100 miles that would allow vessels of deep draft to come to this port at all gensons of the rect result of the work done unfor the direction of this commission and the

ovement has ever

cisco bay.

towed from Portland's docks to the sea fully laden. The permanence of the im-provements made in the river channel the year The letiv which the engineers propos to build at the Columbia's mouth was to

e a single low-tide jetty starting from The record of the improvement work on Fort Stevens, on the south cape, and extending in a westerly direction out across Clatsop spit, a distance of four and one half miles, more or less, as cir-cumstances might require. This jetty



the river, on which a depth of 30 feet should be maintained at low tide. This channel was to be made by concentrating the water flowing out through the en-trance, and thus increasing the resultant currents to such a degree as would as-sure the desired depth at all seasons of posed jetty.

 \sim

tracks.

of the channel at the entrance to the Columbla river followed at a much later period. This improvement from its importance, however, will naturally claim first attention in the present article, and the following full account of the work of building the great jetty at the Columbia's mouth will impart some valuable informa-tion on the general system of improve-ments inaugurated on the Columbia and Willamette rivers from Portland to the

THE COLUMBIA'S MOUTH.

The Great Jetty and Other Government Improvements.

HE Columbia river enters the Pacific ocean between Point Adams, a jutting headland of the Oregon coast, and Cape Disappointment, a projection from the coast line of Wash-ington. Cape Disappointment is a rocky headland which at-NONtains a height of about 200 feet, while Point Adams is a low, changeable, sandy spit running out into the ocean. The distance between the two

points across the Columbia's mouth is about six miles. The Columbia river has long been recognized as one of the chief harbeen recognized as one of the chief har-burs of the Pacific coast. Before the com-in prosecuting this work, and operations nt of the work of improving the were not again resumed until Septembe entrance to the river inaugurated by the 1886. The second appropriation gave the



SECTION OF JETTY NEAR SHORE.

government, the channels over the bar sum of \$157,509 for resuming work on the Jetty.

During the fall and winter of 1886-87 an

were capricious in location and taffable in depth. The depth of the main chan-nel ranged from 15 to 21 feet. The number active search was made by the engineers of these channels varied from one to three, and in location nearly 180 deg. from Cape Disappointment to Point Adams. Delays to shipping entering or departing for a suitable stone supply. It was hoped to open a quarry from which cars could be run direct to the jetty. The delivery of stone by barges was not considered natisfrom the river were frequent, and the Columbia river bir was something of a bugbear to masters of sailing vessels. Today this old order of things is entirely factory by the engineers. Shipping stone for this work by barges necessitated two handlings, and the tide currents and roughness of the water at the jetty land-ing was a fruitful source of annoyance and delay, and with barges it was necesed. The construction of the jetty at the Columbia's mouth has resulted in establishment of one straight chan-on which, as stated before, there is ntained at the shoalest places a mean depth of 31 feet at low tide, and this chan- year. easily entered as the entrance

would thus reach to a point about three miles south of Cape Disappointment. It was to be constructed of stone resting upon a mattress foundation about 40 feet wide and from 2½ to five feet thick, the stone to extend to the level of mean low water. The cost of this feity, when comwater. The cost of this jetty, when completed, was estimated to be \$1,710,000. The first appropriation for the inaugu-ration of work on the jetty was mad n the river and harbor bill of July, 1854 The amount first appropriated was \$100,000. Soon after this appropriation was made. reliminary work was commenced. racts for material were made, and part

will on the shore platforms, placed ups of the plant for carrying on the work was gotten together. The old military post at Fort Stevens, with all its buildollers, taken out on the tramway and lumped off the cars into the water and ings, was turned over to the engineer de-partment for the use of the department then sunk to the bottom by the weight of a liberal amount of small rocks thrown uring the progress of work on this great pon them.

mprovement. Active work was commenced in April The layer of mats forms the foundation on which the rock is subsequently jumped. The mean depths in which the 1885. The receiving wharf, shore tracks of the jetty and storage platform were constructed and part of the jetty itself mats were placed for the whole jetty was was built. Work continued until the end lepths at which these mats rest being 28 of October in that year, by which time feet and in the shallowest places they are eight feet below the surface. over 1580 feet of the jetty was under con-The rock for this work was all purstruction.

The entire amount of \$100,000 first appro hased by contract, and it has been tained from quarries along the Columbia river above Vancouver, and on the banks of the Willamette river above Oswego.

Both of these quarries are distant more than 100 miles from the jetty. The rock was loaded on government barges at the quarries by the contractor, and then towed by the government boat, three harges in each tow, to Astoria. Between Astoria and the jetty a steam tug was used for towing. Discharging three barge-loads of rock, aggregating about 100 tons, was a fair day's work. This supply, however, was not always up to the handling capacity of the plant at the jetty. The average annual amount of rock received at the jetty aggregated from 130,000 to 56.000 tr By July, 1891, the tramway tracks had

een extended out the required length, and the jetty was built up to the height of mean low tide according to the original project by January of the following year, The total expenditure up to this time had unted to less than \$1,500,000, view of the fact that more or less

ettling must in time take place along the entire line of the jetty, it was deemed advisable to pile the rock to a height of at least three feet above the low-water plane. An estimate for the completion of the jetty to a uniform height of four feet, above low water was then made, and the most of the additional four feet was found

most of the additional four teet was round to bring the total cost of completing the jetty up to \$1,82,500. The caninects observed during the prog-ress of the work on the jetty, while rais-ing it to a height of four feet above low water, that the tide would rush act the line of the jetty while it was ab the level of the rock, and in conseque Actors II. was above it prevented the sand in many places from accumulating to the height desired. This greatly endangered the life of the jetty itself. As the work of building the jetty to a height of four feet above low water neared completion, there still remain reasonable doubts regarding the advisabil

ity of limiting its height to four feet. It was evident that raising the jetty above the level of mean low water, which had Recommainsances for stone were made by already been done, was followed by good 1 tion of the jetty

way. This left about 300 feet of track a the extreme end of the jetty standing, and this portion of the track has not since seen disturbed by the waves.

The progress of work on the jetty ha marked great changes in the shapes and ositions of the spits and sandbars in and about the mouth of the river. All thes

changes have been in the interests navigation. The great middle sands at the mouth of the river have been removed by the erosive action of the waters, and this has left a straight out-and-in channel for deep-draft vessels with a depth of II feet, at mean low water. The old north and do, a resistance to the waves and currents, which checks the sand in its pass-age across the spit and causes it to acumulate on both sides. These accumulations spread out for a considerable dis-tance from the jetty and cause the heavy waves to break and lose a large part of

waves to break and tow a mage part of their force before reaching it. As long as this accumulating process can be main-tained with the consequent increase in the height of these acumulations the more hopes will the engineers entertain of the permanent results of the work.

The jetty, as it stands today, has ac-complished one of the great objects for which it was built. It has contracted the waters which pass in and out of the Combia river, and this has insured a suffient current to keep a navigable channel f a depth of 31 feet at low water through this entrance.

TO MAINTAIN THE DEPTH.

The Permanent Feature of the Improvement of the Jetty.

HE aim of the engineers in constructing the jetty was not only to make a deep chan-

nel at the entrance to the Co-

cessive widening of the river. These im-provements were also built across the mouth of the Columbia river has already been visited by a board of engineers with sloughs and channels at the junction of a view of designing and locating suitable the Willamette and Columbia rivers, to batteries for the protection of this road-stead in case of war. The coast reprecontrol the waters of both rivers at that point. sentatives acknowledge the importance o

In the Columbia, improvements were made at St. Helen's, Burke slough and Martin's slough. As a result of these nstructing these fortifications at the buth of the Columbia and this work will ubiless be undertaken by the governstages of the river was obtained by 1891. During the latter year the original prodikes, and it was hoped that on the com-pletion of these dikes, with a fair amount EFORE the extensive work of improving the Willamette and Columbia rivers from Portland of dredging, 25 feet could be maintained in the river from Portland to the sea at the lowest stage of water. to the sea was inaugurated there existed at some half doz-Since 1891, when the work was first

en points along this part of the course of these two rivers shoals, or bars, which were serious obstructions to easy navigation. At these shoal spots the waters of the Colum-bla spread out to great widths. The lessening of the current vetments repaired, the channels of both f of the stream in these bays allowed sands to deposit on the bed of the river in the channel, and it was these deposits that were responsible for the bars regation The great flood of last year resulted in per annum.

ferred to. The distance from Portland to the mouth of the Willamette river is 12 miles. south channels have been closed, and the changes on Clatsop spit are favorable to the stability of the jetty, offering, as they tance is 38 miles. Along this entire cours of 110 miles, except at the few shoal place in the two rivers, the depth of ranges from 40 to 30 feet. For the dis from Portland to the sea the total fall i less than seven feet. At the lowest stage of water in the Willamette river the tid affects the river at Portland about tw feet.

PORTLAND TO THE SEA.

Over This Course.

Prior to 1855 soundings made in the channel between Portland and the set showed a depth of from 10 to 15 feet at the shoalest places. This, of course, was a low stages of water and at low tide. Be fore that time no attempt had been made to increase the depth of water over these should. As a result of these obstructions, both inward and outward bound vessel were compelled to lighter a portion of their cargoes. This involved annoyanes to masters, as well as delays and extra expense.

It soon became evident to the ship-own ers who frequented this river that a per-manent channel of sufficient depth to permit vessels of deep draft to come t

Portland at all seasons of the year could only be secured by an expenditure of large sums of money. The first appropriation for this work was made by congress June 23, 1886. This was followed by other appropriations from time to time, Jumbia river, but also to main-tain the depth of water in this channel after it had once been the state of t channel after it had once been formed. The jetty is a long, thin, narrow backbone of solid material, against which the forces in action at the mouth of the river have accumulated large quantities of shifting and. This sand has tended to break the force of the waves and to thus protect the jetty. The safety of the jetty and the per-manence of the present favorable condi-tion of the jetty channel over the bar will

suit was brought to settle this matter. The supreme court, in a lengthy decision, declared the bill constitutional and valid. As soon as this decision was rendered the commission made every preparation to imence work on the proposed improvements:

The act creating the Port of Portland defined its limits as including all that improvements, supplemented by consider-able dredging, a depth of 19 feet at low of the east boundary line of the Williamof the east boundary line of the Willam-ette meridian and south of the north boundary line of township 1, north of the Base Line. This includes the entire city of Portland and vicinity. ject of improvement made in 1877 was ex-tended to its present broad scope. This proposed the construction of additional The assessed valuation of the property within this district is now about \$44,000,000 The act further declared that the object and purpose of the corporation was to improve the Willamette and Columbia rivers between Portland and the sea, with the view of maintaining a ship chan-Since 1891, when the work was most undertaken in a vigorous manner by the city of Portland, the government has invest stages of water. The commission lowest stages of water. The commission of the Willamette, a dike at Martin's island has been constructed, the dike at St. Helen's extended, other dikes and re-

To enable the commission to carry the the Willamette and Columbia had been dredged at various points along their course and snags had been removed by the issue of bonds to the amount of wherever they were a menace to navi- \$500,000. These bonds were to run for 20 years and were to draw 5 per cent interest The commis ion was further the formation of new shoals below anthorized to levy annually a special tax



SHORE END OF THE JETTY.

Walker's island in the Columbia river. | on all property within its district which Through these shoals the government has dredged a channel 250 feet wide and which carries a depth of 23 feet at mean low water. During the past year the United annual tax, however, was not to exceed State has also dredged a channel 200 feet three-twentieths of one per cent, and this speciality high tax was only to be levied in cases of unusual emergency. The ordi-

at Pillar Rock in the Columbia, and the engineers are now engaged in opening a channel of the same depth at Postoffice har in the Willamette. The last appropriation for the improve-ment of the lower Willamette and Colum-bia rivers was made by congress August 17, 1984. The amount of the appropriation was \$0,090. This, together with an avail-able balance of \$4525, made July 1 pre-