

IRRIGATION OF ARID LANDS
STREAMS OF THE UNITED STATES ARE
MEASURED TO GIVE NECESSARY DATA

The first installment of part IV of the 23d annual report of the United States Geological Survey, dealing with the hydrography of the country, is now in press. The volume will contain a report of progress of stream measurements for the calendar year 1900, with an introduction by Professor F. H. Newell, chief of division; a report on the hydrography of the American isthmus, by Mr. Arthur Powell Davis, giving conclusions based upon his work while detailed to the Nicaraguan and Isthmian Canal Commissions; and a paper on the high plains and their utilization, by Mr. Willard D. Johnson, which is the continuation and completion of the same subject from part IV of the 21st annual report. The part of the volume on stream measurements will be illustrated by 28 plates and 226 figures.

Rivers Measured in 1900.
During the year 1900 rivers have been measured in various parts of the United States from Maine to California, and the estimates obtained of the daily flow of streams form the foundation upon which rest matters relating to the hydrography of the country. A special attention was given to the Southern Appalachian region, with a view to a portion of it being set apart as a National forest reservation. Consideration has also been given to underground waters; surveys of reservoir sites have been continued; the diversion of large rivers, and the utilization of water for irrigation, power, and other industrial purposes have been investigated. The very wide industrial application of the results obtained has been classified by geographic divisions. In the northwestern part of the United States, embracing the northern half of the arid region, the rivers, coming from high mountains, are of larger volume than those of the southern half of the arid region; and the development of this vast extent of public lands depends largely upon the diversion of these streams, the systematic examination of whose great area has, therefore, been termed the diversion survey. In the southern half of the arid region, where the rivers are smaller with intermittent flow, the making of homes upon the public lands depends largely upon the construction of reservoirs, and hence this work falls mainly under the head of reservoir surveys. In every division of the country, all the hydrographic problems enter more or less. For example, in the southwest, the diversion of streams, the development of water power, and sanitary considerations are inseparably connected with the main feature, water storage. The administration of the hydrographic work for the whole country has had in view as its principal aim the obtaining of proper data which shall be the basis upon which the arid lands can be redeemed by irrigation.

Arid Regions of the United States.
The arid regions of the United States include about two-fifths of its entire area, and extend from about the middle of the continent westward nearly to the Pacific Ocean. A broad intermediate sub-arid or sub-humid belt, near the center of the United States, extends over Nebraska, South Dakota, Western Nebraska, Western Kansas and into Oklahoma, and the panhandle of Texas. In very wet years the sub-humid region creeps up to the foothills of the Rocky Mountains during dry years, the greater part of the plains region west of the Missouri becomes semi-arid. Arid regions are those in which the average annual rainfall is 20 inches or less. Large tracts of Nevada, Utah, Colorado, Arizona, New Mexico, and Mexico as well as of the United States, and a great part of the countries of the Old World, are, according to our standards, arid. Irrigation was the basis of the agriculture and therefore of the civilization of many of the ancient peoples, a fact of much significance to us.

If the surface of the globe were flat, the rains would be distributed uniformly in broad bands parallel to the equator, but the uniform movement of the atmosphere is from west to east. The damp winds from the west deposit their moisture on the high masses of the Sierra Nevada, in the winter, and on the Rocky Mountains, in the summer, leaving the broad low plains dry, sterile, and desert-like. Thus the mountain ranges are well watered, while the lowlands are parched with drought. These arid lands, however, covered with a more or less scanty vegetation, only a small per cent being true desert lands, such as the Utah Desert, west of the Great Salt Lake, and the Mohave Desert in Southern California near the Colorado River.

Vacant Public Lands.
One-third of the United States, exclusive of Alaska and outlying possessions, consist of vacant public lands. These lands lie for the most part in the arid region, and crops cannot be produced upon them nor settlers take them up for homesteads until a sufficient water supply has been obtained; then crops are abundant, and the lands are held by the public at large to have all of these good agricultural lands utilized. Who shall make their occupation by settlers possible? The answer must come from the lawmakers of the country, and they must be in possession of the facts in order to act intelligently. The laws governing the disposal of the public lands have been drawn almost wholly with reference to the lands of the Ohio and the Mississippi Valleys, with their sufficient rainfall. This rectangular system of subdivision of the public lands has been found detrimental to their growth in the Western two-fifths of the United States, because attention has been concentrated upon land titles, whereas first thought should have been given to water rights, through which alone the land has value. To remedy this evil for the remaining public lands, and to gather the facts upon which intelligent action can be based is a patriotic duty. These facts pertain first of all to the water supply and its limitations. Irrigation, which concerns all citizens of the United States and their children's children, is the key to this situation. It is the duty of the highest citizenship to provide a hundred homes for independent farmers rather than to permit the land

to be taken up as one or two great stock ranches, controlled by nonresidents and furnishing employment to a few nomadic herdsmen.

The higher mountain slopes and mesas have a covering of trees. Within the arid and semi-arid districts of the Western States nearly 130,000,000 acres are covered with woodland, and, in addition, more than 75,000,000 acres are covered with commercial timber; about 45,000,000 acres are grazing land. Thus, as to area, the grazing industry will probably always be the great industrial pursuit. The open range of the arid region may support one cow to every 20 acres. The same land, watered, may support 10 cows to 20 acres, or in orchards, may support 5 persons to 20 acres. The open range may sell for 30 cents an acre, watered, it may be worth \$5 an acre, and in orchards, \$50 an acre. The grazing land has the greatest extent, and the least value; the irrigated land, the least extent and the greatest value.

The forests of the arid region mark the greatest rainfall and also the source of the streams. In obedience to public sentiment, All of these data are officially distributed, either free or at the bare cost of printing. Topographic maps are important for educational, engineering, political, administrative, statistical and economic uses. The Geological Survey, which is now under the civil service, is, after 20 years of service, well equipped with experienced men and complete outfits, to obtain the information at minimum cost. The state gets full value at one-half cost.

In making acknowledgments for aid extended in various ways by railroad, irrigation, mining and other companies and associations, Mr. Newell says that most of the measurements presented have been obtained through local hydrographers, a comparatively small portion of the work having been conducted directly from the office of the Geological Survey at Washington. The following list gives the names of the resident hydrographers: California—J. R. Lippincott, civil engineer, Los Angeles. Colorado—A. L. Fellows, civil engineer, Denver. Georgia and Alabama—Professor H. M. Hall, civil engineer, Atlanta; Professor W. S. Yeates, State Geologist, Atlanta, and Professor Eugene A. Smith, State Geologist, Tuscaloosa. Idaho—N. E. Ellis, civil engineer, Caldwell. Kansas—W. G. Russell, Russell. Maryland—Professor W. B. Clark, State Geologist, Baltimore.



MAP SHOWING LOCATION OF FORESTS AND WOODLANDS OF THE WEST.

most the Government has already set aside many millions of acres of forest and woodland primarily for the supposed beneficial influence of forests upon stream flow. The open grazing lands of the arid West had and still have their history of conflicts between the interests and the persons of the settlers, the cattlemen, the sheepmen and the lumbermen. So uncertain are the conditions surrounding the use of the public lands for grazing purposes that practically all of the farmers and the irrigators of the arid region, as well as the stockmen, ask for legislation by which temporary rights in the form of licenses can be had to the use of the forage, pending final settlement of the lands. As it is now, the ranges are frequently so overstocked that the valuable forage plants are eaten down and destroyed. This matter of grazing in the arid region, is constantly brought before the hydrographer, and it has an intimate relation to the development of irrigation and the complete utilization of the water resources of the public domain.

Some of the actual desert lands in the United States produce nothing, even when watered, as, for example, the broad flats adjacent to the Great Salt Lake, in Utah, and the lands around Humboldt, Carson and Walker sinks, in Nevada. Others, like the Mohave Desert, near the Colorado River, in Southeastern California, produce large crops when watered. Portions of these desert lands, therefore, are reclaimable by artesian wells, or by reservoirs for storing the intermittent floods of the small streams flowing from the bordering mountains. It is most important that thorough geologic examinations should ascertain the practicability of obtaining water by deep wells, and that such examinations should be verified by drilling a few wells to a depth sufficient to determine for a large desert area whether an artesian flow can be surely obtained.

Advantages of Hydrographic Work.
Professor Newell summarizes the great advantages resulting from local co-operation with the hydrographic work of the Geological Survey, whether the assistance be given by state authorities or by local organizations, as follows:

An extended record of the discharge of a stream shows the area normally irrigable with safety from the stream, as well as the power possibilities, and, in connection with reservoir surveys, indicates the volume of winter and flood water available for storage. The records of stream flow are an official basis for the legal adjudication of water rights. They are essential in considering questions of domestic water supply, irrigation and overflows. The length of time required to establish average water conditions prohibits private investigations, and the construction of reservoirs by the public is impracticable without this information.

Montana—Professor Samuel Fortier, Bozeman. Nebraska—Professor O. V. P. Stout, State University, Lincoln, assisted by Adna Coleman and Glenn E. Smith. Nevada—L. H. Taylor, civil engineer, Carson. New Mexico—P. E. Hargrove, civil engineer, Albuquerque. North and South Carolina—Professor J. H. Hollister, State Geologist, Chapel Hill, N. C., assisted by E. W. Myers. Texas—Professor Thomas U. Taylor, State University, Austin. Utah—Professor George L. Swenson, Logan. Virginia and West Virginia—Professor D. C. Humphreys, Washington and Lee University, Lexington, Va. Washington—Sydney Arnold, civil engineer, North Yakima; William J. Ware, civil engineer, Port Angeles. Wyoming—A. J. Farshall, civil engineer, Cheyenne.

Error of the Index Maker.

New York Sun.
It was not long since the young women in the cataloguing department of the Astor Library were laughing at a beginner there who catalogued Greek roots under "botany." But some of the mistakes made by bunglers elsewhere are just as amusing. Many years ago a young woman who had not yet learned all the intricacies of her work was cataloguing a set of works under "mill." So she wrote: "Mill on Liberty."
"Sitto on the Pines."
That is one of the historic mistakes that librarians quote, and a newer one is just as amusing. This was the result of a young librarian's inexperience, and read: "Lead—See Metallurgy."
"Lead—Kindly Light."
"Lead—Poisoning."
Mistakes of this kind are, of course, not as frequent as those that arise where it is uncertain under which letter a name is to be catalogued. Thus, in the case of the name "Duc de la Rochefoucauld" the name is "La Rochefoucauld" and not "Pocheoucauld," as many persons are likely to write it. Then there are difficulties for the index maker as well as for the reader when it comes to the names of persons who have achieved fame under one name, but are also entitled to another. Dierckx and Beaudouin are examples of this double nomenclature. The way of the index maker is hard.

THROUGH THE COLUMBIA RIVER GORGE.

A delightful trip of a few hours will take you through the famous "Columbia River Gorge," the greatest combination of river and mountain scenery on earth. O. R. & N. train leaves Portland daily at 9 A. M. Return can be made by steamer from Cascade Locks. Special low rates for this trip. Get particulars at O. R. & N. ticket office, Third and Washington.

NEW IRRIGATION BILL

MONEY FROM LAND SALES TO GO INTO A "RECLAMATION FUND."

Secretary of the Interior is Directed to Make Surveys for Storage Reservoirs.

WASHINGTON, June 25.—The general irrigation bill recently adopted by both House and Senate, and signed by the President, reads as follows:

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That all moneys received from the sale and disposal of public lands in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington and Wyoming, beginning with the fiscal year ending June 30, 1902, and continuing until the expiration of the act, shall be deposited in a special fund in the Treasury, to be known as the "reclamation fund," to be used for the construction and maintenance of irrigation works for the storage, diversion and development of waters for the reclamation of arid and semi-arid lands in the said States and territories, and for the payment of all other expenditures provided for in this act; Provided, That in case the receipts from the sale and disposal of public lands other than those referred to in this section are insufficient to meet the requirements for the support of agricultural colleges in the several States and territories, under the act approved July 2, 1902, the deficiency, if any, in the sum necessary for the support of the said colleges shall be provided for from any moneys in the Treasury otherwise appropriated for the construction and maintenance of irrigation works, the quantity and location of the lands which can be irrigated therefrom, and all facts relative to the practicability of each irrigation project; also the cost of works in process of construction, as well as of those which have been completed.

Sec. 2. That the Secretary of the Interior is hereby authorized and directed to make examinations and surveys for, and to locate and construct, as herein provided, irrigation works for the storage, diversion and development of waters, including artesian wells, and to report to Congress at the beginning of each regular session as to the results of such examinations and surveys, and to the practicability of such contemplated works, the quantity and location of the lands which can be irrigated therefrom, and all facts relative to the practicability of each irrigation project; also the cost of works in process of construction, as well as of those which have been completed.

Sec. 3. That the Secretary of the Interior shall, before providing the public notice provided for in section 1 of this act, withdraw from public entry the lands required for any irrigation works contemplated under the provisions of this act, and shall restore to public entry any of the lands so withdrawn which are not required for the purposes of this act; and the Secretary of the Interior is hereby authorized, at or immediately prior to the time of beginning the surveys for irrigation works, to enter the lands so withdrawn from entry, except under the homestead laws, any public lands believed to be susceptible of irrigation from said works. Provided, That all lands entered and withdrawn under the provisions of this section shall be subject to all the provisions, limitations, charges, terms and conditions of the act, and that all surveys shall be completed, and the completion thereof, and the necessary maps, plans, and conditions of cost, the Secretary of the Interior shall determine whether or not said project is practicable and advisable, and if determined to be impracticable or inadvisable he shall thereupon restore to public entry the lands so withdrawn, which it is proposed to withdraw under any contemplated works shall be subject to entry only under the provisions of the homestead laws in tracts of not less than forty nor more than one hundred and sixty acres, and shall be subject to the limitations, charges, terms, and conditions herein provided: Provided, That the construction provisions of the homestead laws shall not apply to entries made under this act.

Sec. 4. That upon the determination by the Secretary of the Interior that any irrigation project is practicable and advisable, he may enter into contracts for the construction of the same, in such portions or sections as it may be practicable to construct and complete as parts of the whole project, providing the necessary funds for such portions or sections are available in the reclamation fund, and thereupon he shall give public notice of the lands to be entered under such project, and limit the acreage which, in the opinion of the Secretary, may be reasonably required for the support of a family upon the lands to be entered, also of the charges which shall be made for the entry of such lands, and upon lands in private ownership which may be irrigated by the waters of the said irrigation project, and the amount of the said charges shall be paid and the time when such payments shall commence. The said charges shall be determined with a view of returning to the reclamation fund the estimated cost of construction of such project, and shall be apportioned equitably: Provided, That in all construction work eight hours shall constitute a day's work, and no Mongolian labor shall be employed thereon.

Sec. 5. That the entries upon lands to be irrigated by such works shall, in addition to compliance with the homestead laws, require at least one-half of the total irrigable area of his entry for agricultural purposes, and before receiving patent for the lands covered by his entry shall pay to the Government the charges apportioned against such tract, as provided in section 4. No right of pre-emption of water for land in private ownership shall be sold for a tract exceeding 100 acres to any one landowner, and no such sale shall be made to any landowner unless he be an actual bona fide resident on such land, or occupant thereof residing in the neighborhood of said land, and no such right shall permanently attach until all payments thereon are made. The annual installments shall be paid to the receiver of the local land office of the district in which the land is situated, and a failure to make any two payments when due shall render a tract subject to cancellation, with the forfeiture of all rights under this act, as well as of any moneys already paid thereon. All moneys received from the above sources shall be paid into the reclamation fund, and the usual commissions on all moneys paid for lands entered under this act.

Sec. 6. That the Secretary of the Interior is hereby authorized and directed to use the reclamation fund for the operation and maintenance of all reservoirs and irrigation works constructed under the provisions of this act; Provided, That when the payments required by this act are made for the major portion of the lands irrigated from the waters of any of the works herein constructed, and the management and operation of such irrigation works shall pass to the owners of the lands irrigated thereby, to be maintained at their expense under such rules and regulations as may be acceptable to the Secretary of the Interior: Provided, That the title to and the manage-

SOME WAR HISTORY

SPIRIT IN WHICH PRO-AFRICAN ELEMENT ENTERED BOER WAR.

An Unfulfilled Prophecy Made Three Years Ago in a Letter to a London Paper.

The following letter, which appeared in the London Times of October 19, 1899, indicates the spirit in which the pro-African element entered into the Boer War just closed. While far from being complimentary to the British, it exonerates them from the charge of having been the aggressors in the struggle. How little the writer knew of the spirit of British patriotism when he spoke of the English and Irish refusing to enlist or be further taxed to maintain the empire! An instance which was duplicated in thousands of cases was that of a soldier of the Enniskillings who fell at Paardeburg, and when the news of his death reached Ireland his only brother enlisted to take his place. This Boer's windy eulogy recalls us of the preposterous statements of Yancy and other leaders in our own great rebellion, who assured the South-



MAP SHOWING LOCATION OF VACANT PUBLIC LANDS.

quired under the provisions of this act shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right of entry hereunder named for the benefit of arid and semi-arid lands within the limits of such state or territory: Provided, That the Secretary may temporarily use such portion of said funds for the benefit of arid or semi-arid lands in any particular state or territory herebefore named, as he may deem advisable, but when so used the excess shall be restored to the fund as soon as practicable, to the end that ultimately, and in any event, within each year period after the passage of this act, the expenditures for the benefit of the said arid and semi-arid lands shall be equalized according to the proportions and subject to the conditions as to practicability and feasibility aforesaid.

Sec. 7. That where, in carrying out the provisions of this act, it becomes necessary to acquire any rights or property, the Secretary of the Interior is hereby authorized to acquire the same for the United States by purchase or by condemnation under judicial process, and to pay from the reclamation fund the sums which may be needed for that purpose, and it shall be the duty of the Attorney-General of the United States upon every application of the Secretary of the Interior, under this act, to cause proceedings to be commenced for condemnation within 30 days from the receipt of the application at the Department of Justice.

Sec. 8. That nothing in this act shall be construed as affecting or intended to affect or to in any way interfere with the laws of any state or territory relating to the control, appropriation, use or distribution of water used in irrigation, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this act, shall proceed in conformity with such laws, and nothing herein shall in any way affect any right of any state or of the Federal Government, or of any landowner, appropriator, or user of water in, or from any interstate stream or the waters thereof; Provided, That the right to the use of water ac-

quired under the provisions of this act shall be appurtenant to the land irrigated, and beneficial use shall be the basis, the measure, and the limit of the right of entry hereunder named for the benefit of arid and semi-arid lands within the limits of such state or territory: Provided, That the Secretary may temporarily use such portion of said funds for the benefit of arid or semi-arid lands in any particular state or territory herebefore named, as he may deem advisable, but when so used the excess shall be restored to the fund as soon as practicable, to the end that ultimately, and in any event, within each year period after the passage of this act, the expenditures for the benefit of the said arid and semi-arid lands shall be equalized according to the proportions and subject to the conditions as to practicability and feasibility aforesaid.

Sec. 9. That the Secretary of the Interior is hereby authorized to perform any and all acts and to make such rules and regulations as may be necessary and proper for the purpose of carrying the provisions of this act into full force and effect.

VERY LOW RATES.

On June 23 and July 1 and 2 the Oregon Railroad & Navigation Company will offer extraordinarily low round-trip rates to St. Paul, Minneapolis, Omaha, Kansas City, Chicago and all points East. Get details at O. R. & N. office, Third and Washington.

SOME WAR HISTORY

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country during the past 30 years (you have had no civil war like the Americans and French to tone up your nerves and strengthen your manliness), and consequently your able-bodied men will not enlist in your so-called volunteer army. Therefore you have to hire the drags of your population to do your fighting, and they are deficient in physique, in moral and mental ability, and in all the qualities that make good fighting men.

Fifth—Your military officers we know to be merely pedantic scholars or frivolous society men, without any capacity for practical warfare with white men. The Afriids were more than a match for you, and your victory over the Southans was achieved because the poor people had not a rifle amongst them.

Sixth—We know that your men, being the drags of your people, are naturally feeble, and that they are saturated with all the horrible sexual diseases, as all your Government returns plainly show, and that they cannot endure the hardships of war.

Seventh—We know that the entire British race is rapidly decaying, your birth rate is rapidly falling, your children are born weak, diseased, deformed, and that the major part of your population consists of feeble, crippled, people, invalids and punics of all kinds, whom you carefully nourish and preserve.

Eighth—We know that nine-tenths of your statesmen and higher officials—military and naval—are suffering from kidney diseases, which weaken their courage and will power, and make them shrink all responsibility as far as possible.

Ninth—We know that your navy is big, but we know that it is not powerful, but that it is honeycombed with disloyalty—as witness the theft of the signal-books, the assassinations of officers, the desertions, the willful injury to the fleet, the mutiny, which all the vigilance of the officers is powerless to prevent.

Tenth—We know that the Conservative Government is a mere sham, and that it is largely reduced the strength of the British Artillery in 1888-9. And we know that it does not dare now to call out the militia for training, nor to mobilize the fleet, nor to give sufficient arms to the land and sea volunteers for ammunition to enable them to become good marksmen and efficient soldiers. We know that British soldiers and sailors are immensely inferior as marksmen, not only to the Germans, the French and Americans, but also to Japanese, Afriids, Chilians, Peruvians, Belgians and Russians.

Eleventh—We know that no British Government dares to propose any form of compulsory military or naval training, for the British people would rather be invaded, conquered and governed by Germans, Russians or Frenchmen than be compelled to serve their own government.

Twelfth—We Boers know that we will not be governed by a set of British curbs, but that we will drive you out of time and altogether, and the other many nations which have compulsory military service—the armed manhood of Europe—will very quickly divide all your other possessions between them.

Talk no more of the ignorance of the Boers of Cape Dutch; a few days more will prove your ignorance of the British position, and in a short space of time you and your Queen will be imploring the good offices of the great German Emperor to deliver you from your disasters, for your humiliations are not yet complete.

For 30 years the Cape Dutch have been waiting their chance, and now their day has come; they will throw off their mask and give evidence of their strength, and 30,000 Dutch heroes will trample you under foot!

We can afford to tell you the truth now, and in this letter you have got it. Yours, etc., P. S.

GAMBLING IN MORALS.

The Pittsburg religious paper, a Roman Catholic weekly, which holds that gambling is not in and by itself sinful, but that it is a means of getting a man's law which did not outlaw a wager. An eminent English bishop has devoted much space to endeavoring to prove that gambling becomes a sin only when a man loses more than he can afford or gives the pursuit more time than he should divert from his duties. The London Spectator reached the same conclusion, and has more than once given the common sense of a gambler, but because of the state of mind and turn of thought which it reveals, stimulates and gratifies. This is a world of law, in which effects follow causes.

The same, healthy and industrious mind, and nature has no room for mere chance or hazard. Both are repulsive to it. The man who finds an agreeable excitement in them is deliberately fostering a frame of mind which unfits a man for the sober exercise of all his powers. This is true in its due measure of all wagers. Any indulgence leads down this path.

The country and the world instinctively felt that the impulse and intent which led Mr. C. M. Schwab, head of the steel trust, to the table at Monte Carlo was not the impulse and intent likely to lead man to wisely manage \$1,000,000 of capital. Probably by this time Mr. Schwab thinks so, too, particularly as steel trust shares instantly fell. No man can indulge the gambling frame of mind, by bet, wager or stake, without impairing the same balance of his mind, an act in itself immoral, and gambling, like all acts, depends for its immorality, not on the mere physical act, but on the frame and intent of mind the act reflects and reveals.

BUSINESS ITEMS.
If Baby Is Cutting Teeth.
Be sure and use that old and well-remembered Mrs. Winslow's Cherry Toothache Remedy. It soothes the child, softens the gums, allays all pain, cures wind colic and diarrhoea.



IRRIGATION LATERAL IN VINELAND IRRIGATION SYSTEM, CLARKSTON, WASH.



WATER DISTRIBUTION IN VINELAND ORCHARD, CLARKSTON, WASH.