

## IRRIGATION IN SOUTHERN CALIFORNIA.

BY DAY ALLEN WILLEY.

As an example of the beneficent results of irrigation of desert lands, a project which has been undertaken in Southern California is probably one of the most notable in America, for its promoters selected a region most of which was entirely devoid of vegetation in any form, the soil, if it can be called such, not even containing enough elements of fertility to nourish the sparse vegetation found in the so-called desert of the Southwest. Prior to the reclamation of this land, one could travel for miles without seeing any vegetation.

Most of the area referred to forms a part of the Colorado Valley, and is situated in San Diego County. The head of the canal was located on the river at a point seven miles west of Yuma, Arizona, and but a short distance from the boundary between California and Mexico. Here the elevation is 120 feet above sea level, a sufficient altitude to give an average fall of from four to six feet to the mile. It was found impossible to construct the waterway in a straight line, owing to the topography of the country, and in its course it makes a wide detour, passing through a portion of the Mexican republic. It is unique from the fact that it is probably the only international irrigation canal in the world, the water being used to cultivate a considerable area in the southern republic.

Work was not begun until August, 1900. Nearly all of the canal was dug by the use of horse excavators and land dredges, some of the latter having a capacity for removing from 1,000 to 1,500 cubic yards in ten hours. As the material taken from the bed was utilized for embankments, such good progress was made that farmers in the irrigated district gathered their first harvests of grain as early as 1903. An idea of the magnitude of the work can be gained when it is stated that the main canal is at present nearly 100 miles in length, with the unusual depth of 10 feet, while it varies in width from 100 to 200 feet at the top. These dimensions show that it is one of the largest water courses of its kind in the world, if not the largest artificial channel for irrigation purposes. Over 500 miles of lateral canals have been connected with the main canal. These vary in size from a ditch a few feet in width, carrying a foot of water, to excavations 30 and 40 feet in width, with a depth of five feet.

As in the case of other western irrigation schemes, as soon as the canal was sufficiently completed to allow a portion of the territory to be watered, connection was made by laterals, and the land placed under cultivation. As fast as the supply was increased, the area served was increased in proportion, until at present about 150,000 acres depend entirely for moisture upon the system. The land is being reclaimed so rapidly that 250,000 acres will probably be under cultivation within the next two or three years. Water began flowing through the supply canal in the summer of 1902, so that the conversion of the desert into productive territory dates back less than two years. Yet the crops of various kinds which are being secured equal in quality and quantity those obtained from other irrigated districts which have been tilled for ten years and over, which seems to prove that this formation, which in a state of nature could not support even the coarsest vegetation, is of a high standard of fertility when properly irrigated.

In cultivating the Imperial Valley, as it is called, the farms have been divided into small tracts, the largest comprising not over 160 acres. It is probably due in part to the intensive system of agriculture that the results already attained have been so successful. Among the field crops which have been raised with profit are such cereals as corn, wheat, and barley; although barley and wheat do not usually thrive as well in specially irrigated soil as when grown on land which is naturally watered. Sorghum has also been raised successfully, as well as sugar beets. Alfalfa—the forage crop which grows so abundantly in other irrigated districts—has yielded exceptional crops in this valley, and from three to five crops in a year can be cut from a single field. Experiments have also been made in the culture of rice and cotton with fair success, while vegetables and the tree and bush fruits which flourish in other portions of California, bid fair to yield as largely here. The extent and value of the crops thus far secured are shown by the receipts of some of the farms, which have averaged from \$60 to \$75 per acre.

With the influx of settlers, a condition has arisen similar to that on the prairie lands of Louisiana and Texas, where the cultivation of rice on such an extensive scale has been carried on within the last few

years. A number of towns have been located in the heart of what was formerly the desert, some of them having a population of several thousands. These towns form the principal markets for the sale of the products of the district. The town of Imperial, which is the principal shipping point by rail, during the first harvest year sent out on an average five carloads of wheat and barley daily during the season.

An interesting feature in connection with the reclamation of this section of the southwestern desert, is that the canal system carries a large quantity of fertilizing material in solution. The Colorado River, passing over many miles of channel which it has cut through soft material, in times of high water is filled with sediment, as is the Nile at the flood period. When its waters are released into the canal, a large amount of sediment is carried through the artificial waterway, and thus enriches the water which is used in the fields. One objection to this deposit is that it tends to fill up the bed of the canal, but this is kept at a proper depth by dredging. The deposited sediment serves to counteract the natural impoverishment of the land by cultivation.

In the southwestern portion of the United States, the government has planned some of its most elaborate irrigation schemes. Over 120,000,000 acres of arid and semi-arid territory are believed to be available for reclamation with suitable water systems, or more than fifteen times the present area of irrigated territory. Much of this area is suitable for pasturing, and contains sufficient fertility to produce forests of commercial timber. Mention has already been made of what has been accomplished in the Pecos Valley. It is a fact that the products of this valley form the principal traffic of a railroad, built specially to carry them



The Desert Before Irrigation. Not a Blade of Grass in Sight.



Bags of Grain Harvested on the Irrigated Field, Awaiting Shipment.

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to market, which is 375 miles in length, and represents an investment of \$5,000,000.

On the morning of September 12 last Encke's comet was rediscovered at the Koennigstuhl Observatory at 17 minutes past 1. The first observation gave its right ascension at 1 hour 46 minutes 16 seconds, and its inclination 27 degrees 24 minutes north. At the time it was seen it was about 2 degrees south of Beta Trianguli, and was moving at the velocity of about one minute of time westward in right ascension and of eight minutes of arc northward in declination. Its course therefore lay due north of the third-magnitude star Delta Andromedæ. It was very faint when first observed, and was distant 107,000,000 miles from the earth, and nearly twice that distance from the sun. It is, however, approaching both very rapidly, the speed being about one million miles toward the sun, and about one and one-half million miles toward the earth respectively per day.

A great convenience around a garage is a pit which permits of the workman taking a position under the machine and working there with some degree of comfort. Such a luxury cannot be indulged in except by those who can afford to go into the pastime extensively enough to warrant a regularly equipped establishment for the housing of several machines. But to answer the same purpose, an inventor has designed a specially-arranged pair of pulley blocks with frames for seizing the automobile by the hubs, and with these the vehicle may be raised and held at any desired height above the floor. The device is made in three sizes to meet the demands of owners having vehicles of varying weights.

## The First Iron Works in America.

BY A. N. SOMERS.

It is not very widely known that the first iron manufactured in America was from bog ore taken from the meadows along Falling Creek, a tributary of the James River a few miles below Richmond.

In 1619 the London Company, the proprietors of the colony of Virginia, sent over a Mr. King and one hundred and fifty skilled iron workers to erect furnaces on Falling Creek. These men came chiefly from Warwickshire and Staffordshire, and when once in Virginia named the village that grew up about their iron works Warwick. The company spent about \$200,000 in the erection of a furnace and opening the mines, from which for three years they produced a good quality of iron. Mr. King soon dropped out of the enterprise, and a Capt. Bluett superintended the erection of the works; but his career was a short one, after which John Berkeley, son of Sir John Berkeley, a nobleman of much distinction, succeeded to the superintendency of the establishment, and conducted it ably until one day—March 22, 1622—the Indians under Opitchapan, a brother of Powhatan, who had succeeded the latter on his death in 1618, surprised the village and murdered Berkeley and one hundred and fifty men and women. The only survivors of the village were a boy and a girl, who hid in the bushes. This terminated the iron industry, and Warwick was but a name associated with the massacre for a long time. In 1700 mills were built upon the ruins of the iron furnace. In those mills was ground the first flour exported from America, much of it going to South America. From that time on Warwick grew rapidly until it became an important manufacturing and shipping village, as it was at the head of navigation.

Shortly before the outbreak of the Revolutionary war, Col. Archibald Cary acquired possession of the vast estate known as Amptill, that lay on the James River and inland along Falling Creek for a distance. The estate was named after one in England. Col. Cary was an active revolutionist, being chairman of the committee that drafted the first Bill of Rights and State Constitution in America, that of Virginia. When the war broke out, he took an active part in the military operations of his country in the South. Tarleton, the British general, sailed up the James River and burnt Warwick and Col. Cary's mills on Falling Creek. It is said that Benedict Arnold the traitor accompanied Tarleton on this voyage. It was an act in keeping with the baseness of his character to have taken part in such retaliation against the patriotic Cary.

The old Amptill house occupied by Col. Cary at the time is still standing, and portions of the ruins of Warwick are to be seen. On my recent visit to the locality, a rainstorm drove me into the old Amptill manor house, where I was kindly received by the present owners, who are descendants of the Cary family. The day was a cloudy one, and I could do but little with the camera, getting only two fairly good views of the site of the old iron works and the Cary mills; but a heavy rain prevented me from taking the house at Amptill.

## The Current Supplement.

The current SUPPLEMENT, No. 1511, opens with an article by Mr. Frank C. Perkins on the manufacture of carbons in England. Excellent illustrations accompany the contribution. Mr. Clifford Richardson's valuable paper on the Constitution of Portland Cement from a Physico-Chemical Standpoint is concluded. A simple German instrument for testing the magnetic properties of iron is described and illustrated. Prof. N. Monroe Hopkins' second paper on Experimental Electro-Chemistry is published. This paper discusses in a simple way the theory of electrolytic disassociation and osmotic pressure and its measurement. By far the most interesting feature of the SUPPLEMENT is a controversy between Prof. Wood and Prof. Blondlot. Prof. Wood sharply criticises the methods adopted by Blondlot in investigating the N-rays, and, indeed, casts doubt on their existence. Prof. Blondlot replies in a paper written at the Editor of the SCIENTIFIC AMERICAN'S request. Commander R. E. Peary writes interestingly of his last North Polar trip. Excellent pictures accompany the text. Another installment of the monograph on "Current Wheels, Their Use in Lifting Water for Irrigation," is printed. G. C. Henning tells much that is interesting about diamond tools. Miss Agnes Clerke contributes a paper of absorbing interest, which bears the title "The Procession of the Sun."