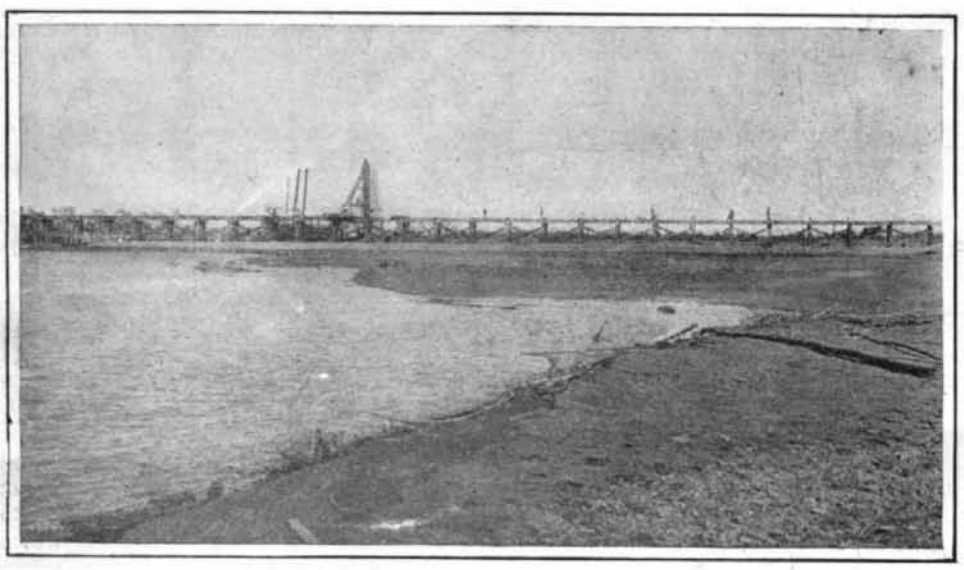
THE COLORADO RIVER CLOSURE.

BY W. D. H. WASHINGTON, ASSOC. MEM. AM. SOC. C.E.

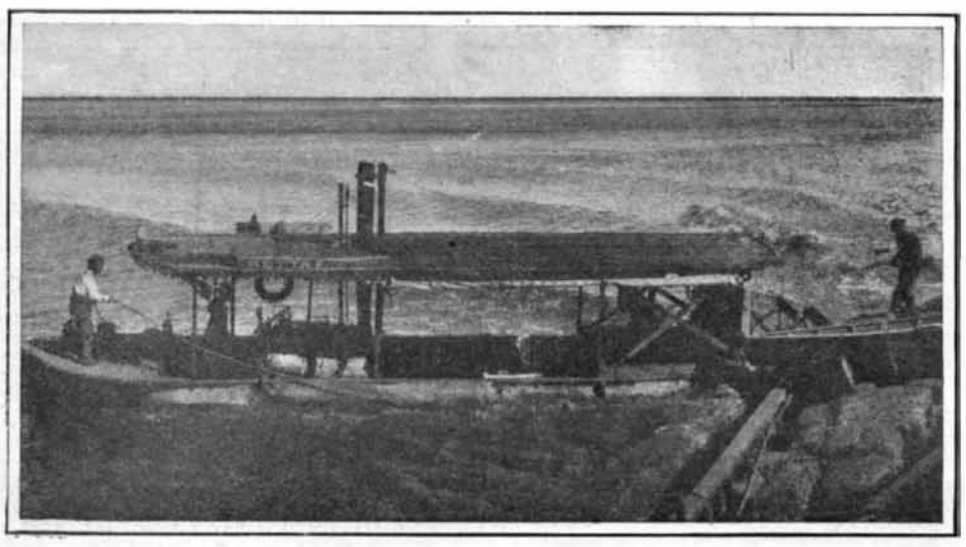
After numerous fruitless trials, and a temporary stay, decision seems to have been finally rendered, in the case of the People vs. the Colorado River, in the celebrated Salton Sea matter.

Few questions have attracted such wide attention, and seldom have greater interests or values been involved by a river's overflow than in this case, which was not alone of local but of international importance. Seldom have engineers had a more difficult, obstinate, and refractory problem to deal with, and seldom has a greater victory been won over rebellious nature; in proof of which, let the facts be noted: First, that the statistician of the U. S. Reclamation Service has in a recently published article estimated the amount of damage that might be done, in case this break of the Colorado were not stopped, would eventually approxi-

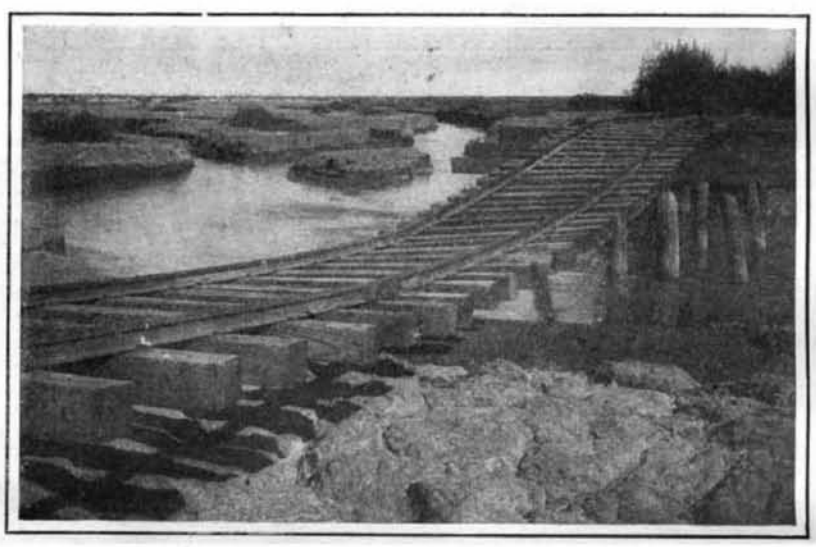


Trestle Over Hind Dam, Lower Heading.

The Washing Away of a Trestle.



The "Bore" at the Mouth of the Colorado.



Railroad Tracks Undercut by the Colorado.

Dynamiting

New Bed and Channel of the Colorado.

Railroad Wreckage on the Shores of the Salton Sea.

Falls in New River, Showing How the Colorado was Cutting Out, by Recession, a Gorge Similar to That at Niagara.

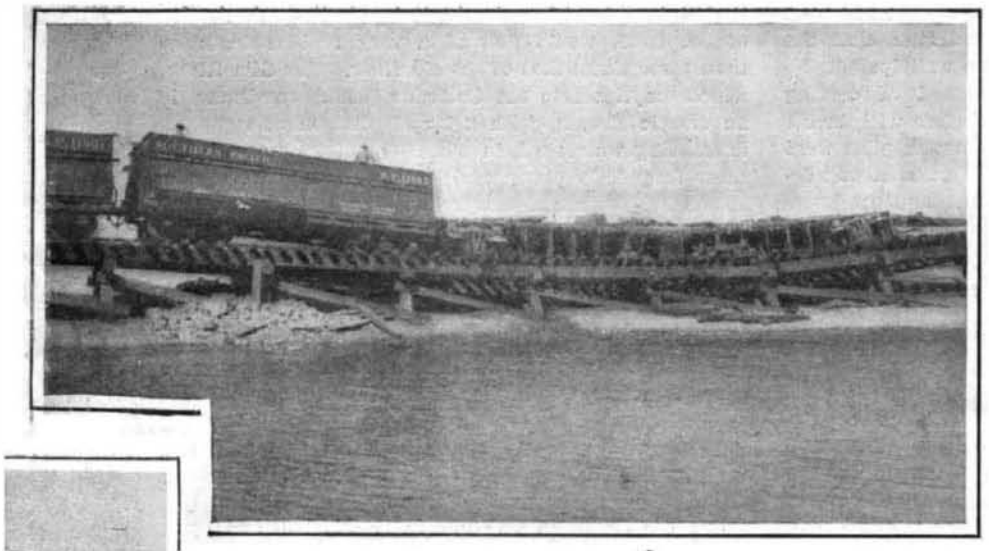
Destruction of the Railroa

A GREAT RIVER GONE ASTRAY. RESTORING THE COLORADO RIVER T

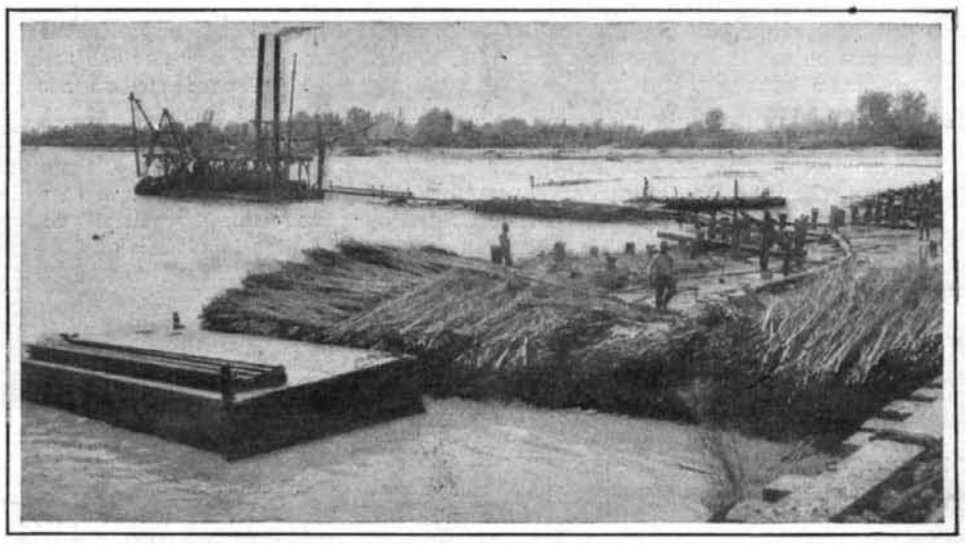
mate $700,000,000; and second, that the yardage which has actually been removed by the rush of water to the Salton Sink is probably several times greater than will have to be moved in digging the Panama canal.

The Colorado River is not popularly known as one of the great rivers of the United States; but when one realizes that it drains an area equivalent to nearly one-fifth of that of the whole United States, namely, all that great territory lying between the Rocky Mountains and the Sierra Nevadas, and extending from the watersheds of the Yellowstone to the Gulf of California, one realizes that the Colorado River, as though resenting the fact that its importance has been overlooked, has of late been demanding its due share of public attention.

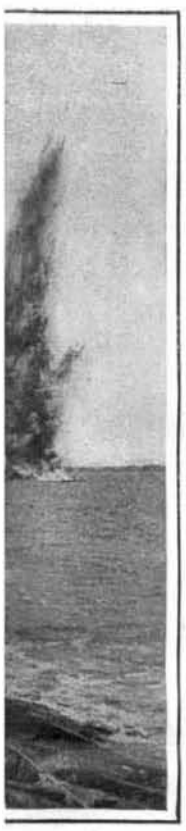
There is said to be a heated rivalry as to whether Lordsburg, New Mexico, or Yuma, Arizona, is the hottest place in the United States. The popular verdict,



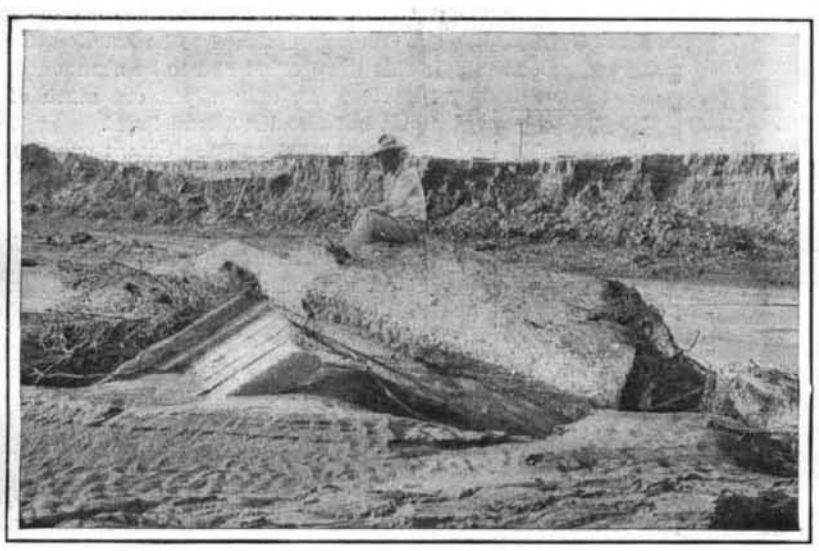
Railroad Wreck at Lower Heading.



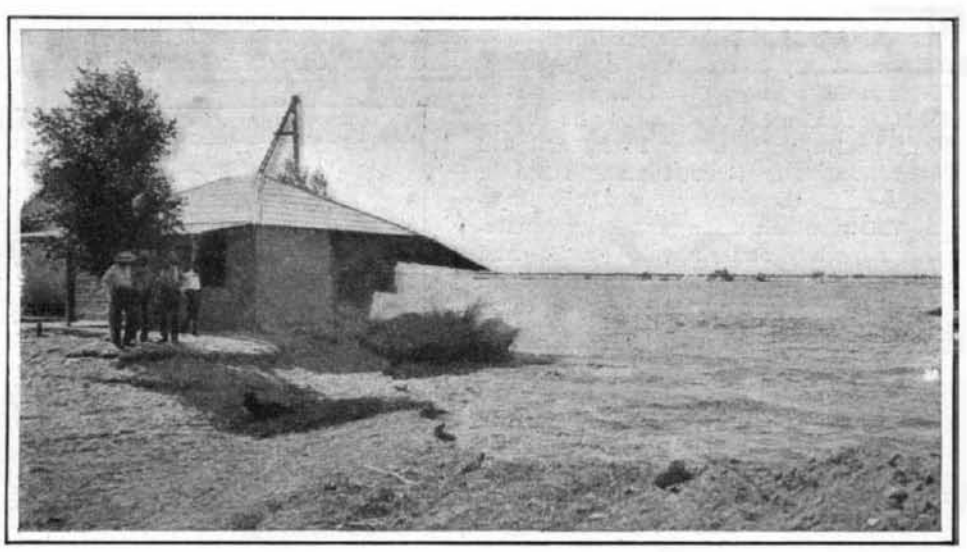
Constructing Mats for Closing the Break.



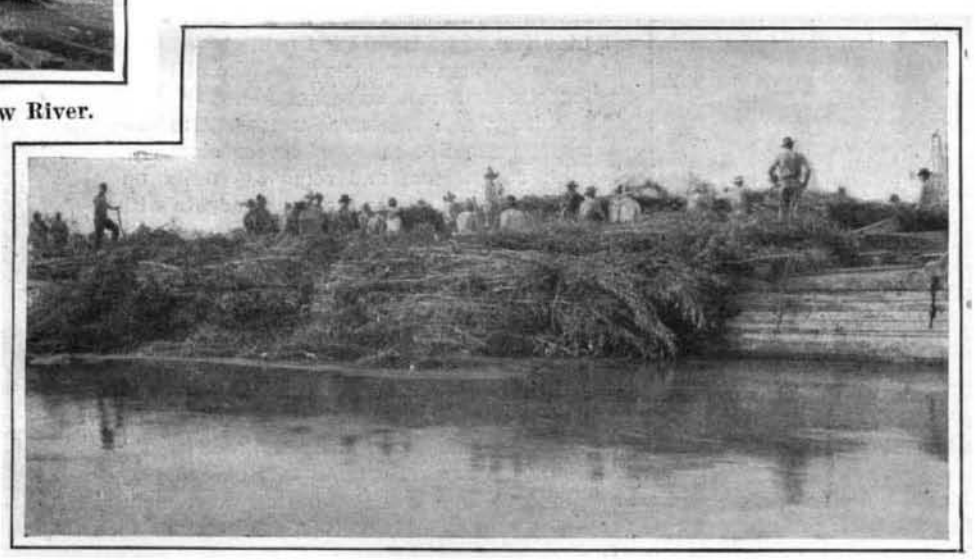
New River.



Erosion in New River.

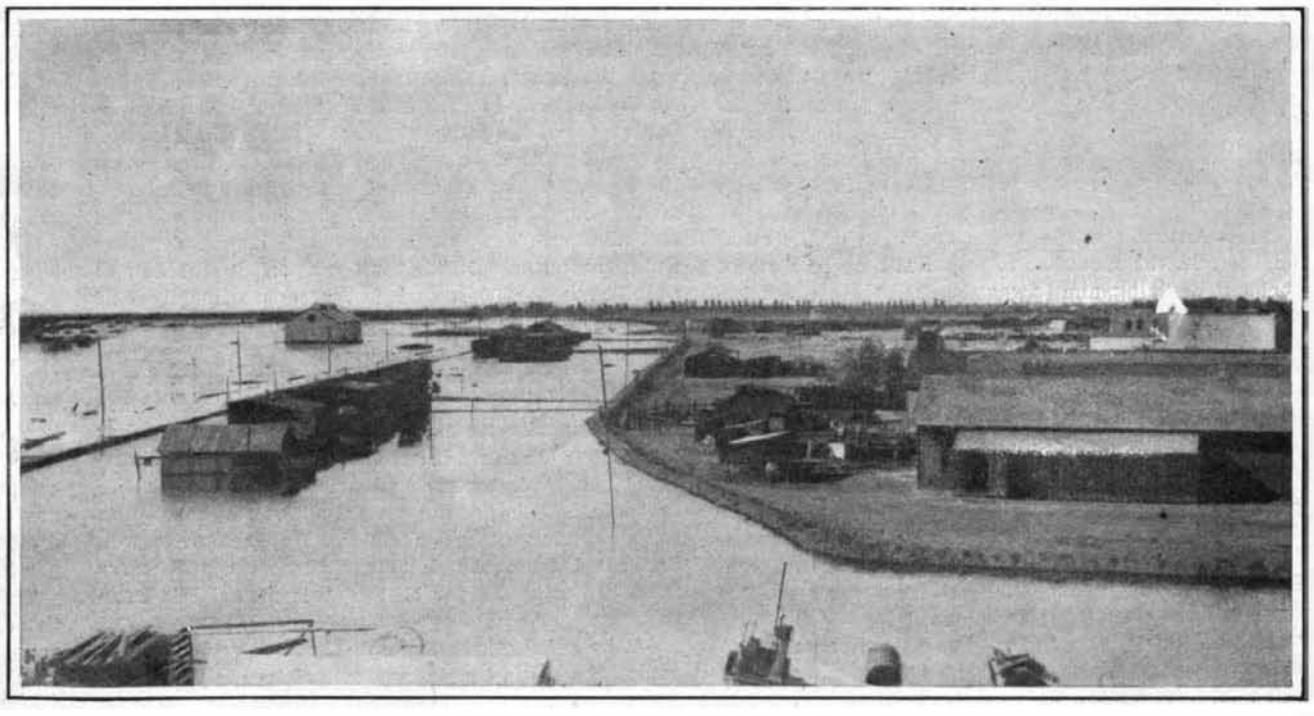


Snapshot of Falling House at Mexicali.



Making Brush Mats for Closure Works.

Banks of New Channel Cut by the Colorado.



Before the River Cut Through at Mexicali.

d; Calexico and Mexicali.

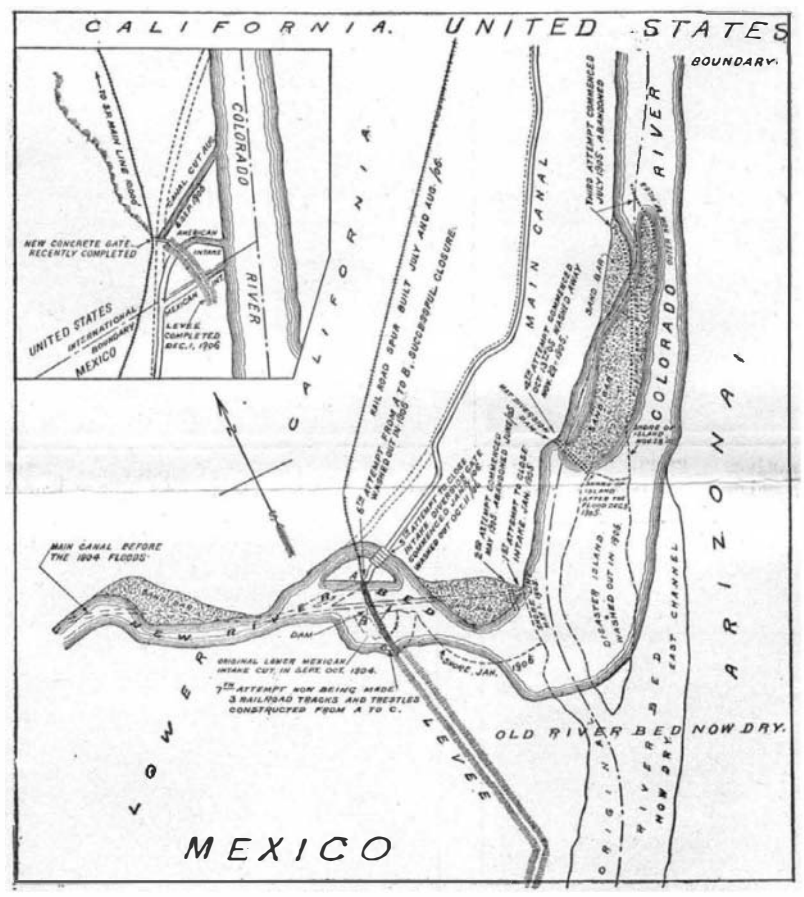
O ITS NATURAL CHANNEL AND THE EXTINCTION OF THE SALTON SEA.

however, has conceded the palm to Yuma. Beyond question the desert of Sahara is popularly regarded as the hottest, most arid, and hopeless place on earth; but meteorological observations of rainfall and temperature are said to award this distinction to the famous Salton Sink, approximately one hundred or more miles west of Yuma, which has the peculiarity of a minus elevation as regards sea level, being 287 feet below the universal datum, and probably one of the deepest depressions on the face of the earth unfilled by water. So arid was a large part of this region, that it did not produce any more vegetation than the paved streets of New York. To all appearances, it was merely a dried-up mudhole, black, cracked, and baked.

But, uninviting as the soil appeared, some one discovered that if water could be obtained for irrigation, it was of marvelous fertility and richness, being, in fact, the cream of the soil of the vast plains drained by the Colorado River, which had been carried down by the river in the form of silt and deposited there in ages past, and that the temperature in this region, which is said to reach as high as 170 degrees in the sun, would aid and abet the growth of vegetation to the utmost degree under such conditions, making practically an open-air hothouse.

In 1896 a project was inaugurated and incorporated under the name of the California Development Company, to divert a part of the waters of the Colorado River and lead them into the Imperial Valley, an upper bench of the Salton Sink. Nature had invited this proposition, and had done a good deal of the engineering, and even construction work, in advance, for the Colorado River, at its periods of greatest floods, occasionally overflowed its banks about twelve miles below Yuma, and had cut a flood-water channel many miles in length across the country toward the Imperial Valley, which made practically a natural, ready-made, and excavated canal. And it was only necessary to tap the river and turn its waters into this canal, to cause them to flow for practically fifty miles in the desired direction without much additional work.

In 1900 the California Development Company tapped the Colorado several miles above where the dry channel of the Alamo met the Colorado, a headgate was put in and an artificial canal was cut parallel with the river and from 800 feet to 5,500 feet distant, connecting with the Alamo River or channel. Between the headgate and the Alamo River ran the International Boundary Line between the United States and Mexico. The water was diverted in the United States line, ran across the border in the artificial canal, thence into the Alamo, and for some distance through Mexican territory, and finally back into the United States and Imperial Valley. At Sharp's Corners diverting ditches were cut, headgates and controlling works were put in, together with laterals and the details of an irrigation project. Owing to the necessity of getting the water into the Imperial Valley at a specified time, the headgate was put in higher than was originally planned, and above the water level at low stages. As a consequence, there were times when it was difficult to obtain water.



MAP SHOWING THE LOCATION OF THE VARIOUS ATTEMPTS TO CLOSE THE BANKS OF THE COLORADO RIVER.

The introduction of water into the Imperial Valley proved its soil to be possessed of marvelous fertility; so much so that a crop of alfalfa could be cut every six weeks, and vegetables and crops grown almost as fast as they could be planted, mature, and be harvested. Naturally, the productiveness of the soil attracted dwellers, and in a short time over 2,000 farms were under cultivation, and some 12,000 people became residents in the valley. Within a few years this section had grown from an arid and almost hopeless region, and become second only to San Francisco and Los Angeles as a producer of freight for the Southern Pacific Railroad.

But a serious obstacle to the operation of the canal was met in the fact that it would silt up in spite of constant dredging, and it was found difficult, if not impossible, to get water enough to irrigate the lands already under cultivation whenever this emergency occurred. By way of remedy, in the fall of 1904 a ditch was cut from the Alamo channel at a point about four miles below the original headgate to tap the Colorado direct at a lower level, and get water into the canal at the low stages of the river. The river fall here approximates one foot and two-tenths feet per mile. This ditch was 11 feet deep, and 50 feet in width, and a little over 3,000 feet long; but in spite of its dimensions, it rapidly silted up. The channel was again cut open, only to close itself as before.

A third time it was opened, but a flood occurring at this time in the Colorado, widened and deepened the ditch until very soon practically the whole river had deserted its old channel and begun to flow across country, leaving its bed dry and some eighty miles of its old estuary waterless. Then came a long series of efforts to stop this breach, which it was found necessary to close entirely.

The first attempt consisted of a series of piles driven some three feet apart, filled in with brush and weighted with bags of sand. This dam was unsuccessful for the reason, it is said, that the supply of bags gave out before the work could be completed, and what had been done was destroyed. This failure indicated that the task was a greater one than had been anticipated.

The second method adopted consisted of driving piles and damming against them as before with brush weighted with bags of sand. But as fast as piles were driven on one side of the opening, the current was deflected to the other bank, which eroded, and the opening remained practically as it was, simply changing its location in advance of the brush and in advance of the closure work. This attempt was abandoned after about one month's work.

The Salton Sink had become flooded during these brief operations to such an extent, that it became necessary to move the tracks of the Southern Pacific Railroad. The problem had now assumed grave proportions. Self-preservation being the first law of a railroad as well as of man, it became necessary for the Southern Pacific to take hold of the task, the funds of the development company having become exhausted. Col. Epes Randolph, the resident vice-president of the Southern Pacific Railroad at Tucson, Arizona, an eminent and tried engineer who had fought the floods of several Southern rivers, and built one of the first railway bridges across the Ohio River, now took charge of the undertaking, and Mr. C. E. Rockwood, a civil engineer who conceived the idea of this irrigation project, was made chief engineer in charge of the work.

To give an idea of their task, it seems desirable to look over the situation and conditions.

The Colorado River, rising practically in Montana, its water resulting largely from the melting of snows upon the two great continental ranges, naturally has its flood periods in the seasons when the snow is melting on the mountains; and consequently the summer, from May to September, is the period of its greatest flow. And as is the case of many rivers in arid regions, there is a vast difference between its maximum and minimum flow, the former being practically fifty times the latter. During its flood periods, the flow is as high as 120,000 second feet or approximately half the flow of the Niagara River where it passes over the falls.

It must be remembered that this river is practically bottomless, in the sense that its sides and bottom are nothing but silt, through which no boring or pile has ever been able to reach solid bottom. This silt, moreover, is as fine in texture as flour and melts away, when in contact with flowing water, almost as readily as would a mass of brown sugar. Its fineness is well illustrated from the fact that the river will carry from two to seven per cent of this material in solution.

At the point where the cut, above referred to, was made, the elevation is approximately plus 118 feet above tidewater. The bottom of the Salton Sink is minus 287 feet, and the river at this part of its course is running high along the edge of a great bowl, of which the Salton Sink is the bottom. Like many other silt-laden rivers, the Colorado River has raised itself above the level of the surrounding country, and has been known to raise its bottom as much as seven feet on the gradual subsidence of a single flood. This would be cut away to a large extent by the next recurring flood; but it will be seen that with a fall of some 400 feet to the Sink, this river, should it break through the lip of the bowl, would flow at a very rapid rate, more than three times that of the old river. The Gila River, which empties into the Colorado just above Yuma, is an erratic stream, with a largely barren and rapidly descending watershed, in which cloudbursts and heavy rains frequently occur, and the bed of this river will sometimes, within a comparatively few hours, change from the condition of a dry channel to that of a raging torrent, discharging as much water as the Colorado itself.

The next effort was somewhat after the method used in the Mississippi and Eads jetties. A row of piles was driven along the American side of the river to Disaster Island, with the expectation that sand bars would form on the Mexican side below, thus increasing the flow in the other channel, which it was hoped would cause it to take its old course also and make a deposit across the mouth of the cut.

But the Colorado was not to be cajoled, and by a rapid rise practically dug up the piles.

A second row of piles was tried farther up the river, with the view to depositing the silt against the lower row; but the Colorado declined to be handled like the Mississippi; this third effort had to be abandoned, and the river not only wiped out much of the work, but also the island itself.

Next a brush-and-pile dam, some 600 feet long, was built across the Mexican channel, and when it was nearing completion, the second largest rise in the recorded history of the river occurred and wiped it out.

Next a wooden headgate was built on the bank of the crevasse as a means of controlling the river, which was to be turned through this headgate while closure was made. Although this work was pushed with all possible expedition, it was not completed in time to turn the water through, and mend the break, before the summer floods of 1905 arrived. These were particularly heavy, and opened the crevasse alongside the headgate, which was originally 600 feet wide, to something like 2,600, depositing a solid bank meantime in front of the headgate for some 1,500 feet.

The problem now took the shape of building a dam across an opening nearly 3,000 feet long; and it became necessary to construct some five miles of levees along the bank downstream and some 3½ miles upstream to connect the wooden headgate with the concrete headgate. Also it was necessary to deepen the old canal for some 3½ miles, and cut a new canal about 600 feet in length, to let the river into the new headgate, or bypass, which had practically been built on dry land. Some 300,000 yards of material were to go into the dam, and 400,000 into the levees. A track was now put in from the Southern Pacific Railroad to the site of the dam. Quarries were opened, clay and gravel pits developed, and preparations were made for the weaving of great mattresses and fascines to aid in the closure.

Particularly heavy was the rainfall in 1906, and the Salton Sea raised to a height that it would have taken three years of ordinary rainfall and river flow to reach. This necessitated a removal to higher ground of some forty miles of the Southern Pacific Railroad tracks some three or four times in succession.

The scene now became one of tremendous activity. Hundreds of teams, two dredges, and several steam shovels were at work; 600 feet of the opening was mattressed; a line of piles was driven; brush fascines 18 inches in diameter and 100 feet long were constructed, and held together on foundation cables 5/16 feet in diameter, and the whole dumped against piles driven at intervals across the opening. But the current scoured out beneath the mattresses, and the bulkheads of pile and brush reinforcing the ends of the mattresses.

A trestle carrying the railroad tracks was thrown over the center line of the mattress and along the center of the proposed dam. Carloads of rock and gravel were dumped by the hundred. The river was drained, and finally the entire volume of the river was passing through the wooden headgate.

The Colorado declined again, however, to submit to the dictates of man, and a flood brought down large quantities of driftwood, which lodged against the gate, inducing a scour against sides and bottom.

Spur tracks and materials were rushed with all expedition, and an attempt was made to fill the gate with rock to hold it down and save it, when, suddenly, the

water broke under and some 120 feet of the gate rose from its place and floated downstream a hopeless and unrecognizable wreck, and lodging some distance below. Thus ended the fifth attempt.

The best previous practice seeming to be useless in endeavoring to cope with the Colorado River, Col. Randolph and his assistants determined to conquer the river the next time by main strength. Three lines of trestle, each to carry a railroad track, were projected across the breach, parallel with each other, and preparations were made to dump vast quantities of rock, as large and as heavy as could be obtained, and make three rockfill or cascade dams, one parallel with the other across the bypass opening, thus throwing the water across the larger opening of the old dam or break. Every facility and resource of the great Southern Pacific Railroad was now utilized; every quarry within 400 miles was requisitioned; and some 200 carloads of rock were rushed in and dumped into the break daily. This work began on November 24, and in twenty-one days every drop of water was cut off and the water was forced down the old channel of the Colorado River where it belonged, and the break was closed. Meanwhile the needs of the Imperial Valley were taken care of by water passed through the new concrete headgate, and apparently the Colorado River had capitulated and surrendered to engineering skill and man's authority.

The Colorado, however, was equal to another insurrection. It made an attack below this dam, which held its own, but broke through the levee below; turned around behind it; cut it away and part of the dam from the back; and, within a few weeks, all previous efforts had been set at naught, and the entire body of the river was flowing unimpeded into the Salton Sink through an opening about two-thirds of a mile in width.

The seventh attempt at closure was begun in earnest on January 27. Three lines of trestles, resting on piles 65 to 90 feet in length, were built across the break with much difficulty, a portion of one of these trestles being swept away three times. Indeed, it was found necessary to weight the piles down with water tanks to keep them from being carried away.

In the sixth attempt at closure, 2,200 cords of brush and three-fourths of a mile of railway, over 1,000 piles, and some 200,000 yards of rock and gravel and other material were used. But the last contest was still more severe, calling for the services of 375 Indians, 400 Mexicans, and 500 white men, seven locomotives and a steamboat, and dredges; also 100,000 cubic yards of rock and 75,000 yards of clay and gravel were hauled out on these trestles and dumped overboard; thus making a cascade dam; raising the level of the river some 12 feet, and throwing it back into its old channel, into which it began to flow about February 26. After so many unsuccessful attempts, the question still remains, "Will this closure be permanent?"

Advices received by the writer from Mr. Randolph on April 2 advise that "the new work and the new levees have stood a 27-foot stage of water in the Colorado River." He writes that the muck ditches have proven effective in preventing the water from passing under the levees; but he says this may not be the condition when there is a maximum of 33 feet on the Yuma gage, though he believes that the levees will prove effective, even against this height.

The writer considers that in overcoming the Colorado River, Col. Epes Randolph and his able assistant, Mr. H. T. Cory, have won one of the greatest engineering victories and performed one of the most remarkable and difficult engineering feats ever accomplished, and that engineering is the richer for their demonstration of the efficiency of the cascade dam for controlling obstreperous rivers. He considers further that the people of Mexico, California, and Arizona, if not of the nation, owe many thanks to the Southern Pacific Railroad for taking hold of a bankrupt enterprise and furnishing men, money, and physical equipment and saving such large and important vested and property interests.

THE JAPANESE SQUADRON AT JAMESTOWN.

(*Continued from page 373.*)

partures, ammunition passages have been dispensed with and a new arrangement has been made instead, special ammunition hoists being provided for the 12-inch guns. The forward conning-tower has no side entrance at the back of its wall, but is entered from the upper bridge through a trap-door on the roof of the tower. There are smaller conning towers also over the 6-inch guns on the upper and main decks to control the gun fire. Her great width, which is 75 feet, was probably a record in cruiser construction at the time she was designed. The "Tsukuba" is the first cruiser ever equipped with 12-inch guns, of which she has four—two in the forward and two in the after barbettes on the upper deck. Besides, the ship carries twelve 6-inch quick-firing guns, an equal number of 4.7-inch quick-firers, two 12-pounders, and four Maxims. She can bring four 12-inch guns, six 6-inch guns, and six 4.7-inch guns to bear in broadside fire. As to the fore fire, the cruiser can most effectively train two 12-inch guns, four 6-inch guns, and four 4.7-inch guns.

Although no official statement of her steam and gun trials has been given to the public, this much is absolutely certain, that not only was everything satisfactory but in some important respects the results of the trials exceeded expectations. Her maneuvering power is said to have proved exceptionally good, the ease with which she was steered and handled to have been very remarkable, and even the rough weather which she experienced at the time failed to make her roll to any perceptible degree. In all her gun trials the results were, according to accounts, all that could have been desired.

A correspondent on board one of the ships writing to the Jiji-Shimpo under date of the 2d instant says: "Although we encountered very rough weather on the day we left Yokohama, the behavior of the 'Tsukuba' was splendid and she neither rolled nor pitched in the slightest degree."

Vice-Admiral Ijuin, commander-in-chief of the Celebration Squadron, sprang from the warlike clan of Satsuma, which produced Saigo, Okubo, Togo, and many other heroes. He was born in 1852 and took part in the War of the Restoration when he was quite young. In 1871 the vice-admiral attended the Naval College, Tokio, and six years later he was sent to England to prosecute his naval studies. While there he served on board the British warship "Triumph" and was also admitted to the Greenwich College. In the time of the Japan-China war, the vice-admiral was a captain and held the post of naval staff officer at the imperial headquarters. In March, 1902, he was appointed commander of the Standing Squadron, and was sent to England in command of the "Asama" and the "Takasago" to participate in the ceremonies in connection with the coronation of King Edward. In September, 1903, he was promoted to the rank he now holds and appointed vice-chief of the Naval Staff Office under Admiral Viscount Ito. During the Russo-Japanese war, he was put on the naval staff of the imperial headquarters and took part in its councils, doing distinguished services to the state, for which he was awarded the first-class order of the Golden Kite with the Grand Cordon of the Rising Sun. In November last the vice-admiral was transferred to his present post of commander-in-chief of the Second Squadron. He is the inventor of a special fuse, which made possible the use of the Shimose explosive. During the late war, Capt. Takenouchi, commander of the "Tsukuba," commanded the "Nisshin," and Capt. Yamaya, commander of the "Chitose," commanded first the "Akitsushima" and then the "Kasagi," both rendering meritorious services which were duly recognized. The crews of the two cruisers are most of them men who took part in the war.

According to the itinerary already published, the squadron is expected to arrive at Jamestown on May 8 and to stay there for about twenty days, after which it will visit New York, London, Wilhelmshafen, and Cherbourg. The warships will return to Yokohama in November.

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

SLEEVE-HOLDER.—HERMINIA M. M. BARNES, Ludlow, England. This device maintains short or elbow sleeves in place when putting on an outer garment. The sleeve is bindingly held to the arm by an elastic tape having a ring secured at each end thereof, with one end of the tape passing through one of the rings to form a loop by which the sleeve is embraced about the arm and the other ring serving as a means to be passed over the thumb or finger for maintaining the holder in operative position.

BOW-NECKTIE.—W. A. CLARKE, East Ham, London, England. The more particular object in this case is to produce a "bow-necktie" provided with means whereby it may be fastened upon the outer flaps of a turn-down collar. One advantage of the tie is that persons of different tastes may mount it in different positions relatively to the collar.

Electrical Devices.

SECONDARY-BATTERY PLATE AND METHOD OF MAKING SAME.—L. N. J. ROSELLI, 14 Rue de la Fidélité, Paris, France. The invention consists, broadly, in forming by fusion, casting, and molding a core of active material and in casting around this core a support presenting the form of a grid with multiplying ramifications, this support being cast in a mold the core of which is constituted by the core of active material itself, which, as indicated, has previously been cast.

TROLLEY STAND AND POLE.—G. Q. SEAMAN, New York, N. Y. This trolley-stand will operate automatically to depress the trolley-pole in case the trolley-wheel becomes displaced from the wire, the general purpose being to prevent injury to guy-ropes or overhead construction. Means are provided for mounting the trolley-wheel which will enable it to be detached readily by the overhead construction in case it becomes fouled therewith. In this way the dislocation of the pole from the stand is prevented.

Of Interest to Farmers.

PNEUMATIC COTTON-HARVESTER.—J. E. WORSWICK, Montgomery, Ala. This picking-machine is of novel construction and arrangement of picking-nozzles, and of novel construction and arrangement of the receiving-chamber with provision for drying wet cotton and removing sand and dirt and condensed water and in the novel construction and arrangement of suction and blowing fans in connection with a motor, and in the novel construction and arrangement of a ventilated storage-receptacle and its accessories.

THRESHER-FEEDER.—T. N. JOHNSEN, Clark, Wash. Straw is carried to the machine and lifted into the hopper. Straw is dropped onto the hoe-down by forks. Rollers tear the bunches apart, throwing them out on endless carriers in the hopper sides, which deliver them through the opening in the bottom of the hopper onto an endless carrier, thence to the draper and to the machine. By means of a swinging-frame the feed of the same carrier to the draper is regulated, since the adjacent run of the carrier on the frame and former carrier move oppositely, and by swinging the frame nearer or farther from the same the layer of straw delivered may be nicely regulated.

ROOT AND STALK PULLING MACHINE.—J. L. ANDERS, Pittsbridge, Texas. In this patent the invention relates to implements for clearing the earth of stalks, roots, vines, etc. The object of the invention is to produce an implement which will be drawn along by horses and which may be easily operated by the driver, so as to dig roots or stalks from the ground.

Of General Interest.

LIFE-RAFT.—P. C. PETRIE, New York, N. Y. The essential object of this invention is to provide a practically indestructible life-raft with a maximum passenger-carrying capacity proportionate to its size. These rafts may be fitted for use on seagoing craft by supplying them with lockers for the necessary stores of food, water, signals, etc. Mr. Petrie finds "Palo de balsa" the wood best adapted for the raft.

TIMBER-CUTTING DEVICE.—E. C. POLLARD, Seattle, Wash. This device is for use in cutting timber by burning a well-defined kerf through the log or tree. The invention more particularly relates to means for directing a blast of air to promote combustion and for preventing the timber from burning at other points than those required for severing it.

PROCESS OF MAKING HYDRAULIC CEMENT.—E. MUELLER, Alsen, N. Y. The process consists in mixing together pulverized coal and a pulverized flux and feeding the mixture simultaneously into the kiln for calcining the cement clinker, the admixture of flux with the coal and its diffusion and immediate action throughout the kiln serving to calcine the cement at a lower temperature and in a shorter time.

Hardware.

NUT-LOCK.—G. W. ROBERTS, Minersville, Pa. The object of the invention is to provide a nut-lock for securely locking the nut in place after it is screwed up and to allow convenient unscrewing of the nut whenever it is desired to do so and without destroying any of the parts, thus permitting free use of the bolt, nut, and lock.

SAFETY-LOCK.—J. E. LEDFORD, Butte, Mont. In this patent the invention has reference to locks—such, for instance, as are used upon doors, windows, and analogous closure members—Mr. Ledford's more particular object being to provide a lock with means for preventing its being picked or actuated surreptitiously.

CLASP.—O. FISHER, Sloan, Iowa. In this case the invention is an improvement in clasps, more especially designed as a means for holding the sections of stovepipes together, although not limited to this particular use, as it may be employed with advantage in other relations, where a safe, strong, and durable clasp is desired.

FARRIER'S KNIFE.—D. R. BALDWIN, Ravenden Springs, Ark. This patentee's improvement, generally stated, consists in a thin double-cutting-edged paring-blade adapted to be pivotally attached at the bottom of an animal's hoof and positively held in adjusted relation thereto as it is swung on its pivotal connection to remove the outer surface.

Household Utilities.

CREAM-SEPARATOR.—S. W. STEWART, Spencer, Ind. The invention is a novel device for separating the cream that rises to the upper surface of milk, and is especially designed for drawing off the cream that collects at the top of milk-bottles, as delivered for family use, thus adapting it for a household convenience and desirable kitchen article.

WASHING-MACHINE.—J. W. SEIFERT, East Point, Ga. The machine is of that type employing a revolving drum in which the clothes are placed, and the patentee constructs the drum with certain special features designed to give increased efficiency. The hinged cover of the machine and the revolving drum are so arranged in connection with a pivoted lever that the latter may be shifted so that the cover is raised and the drum lifted from the machine and caused to move outward and be supported on the lever.

Machines and Mechanical Devices.

CONDUIT-TRAVELER.—L. D. SHAFFER, Paint Borough, Pa. In this case the machine is adapted for drawing heavy cables through conduits. The invention provides means for withdrawing or slightly retracting the entire wiring machine when desired, as it sometimes happens in using the device in a conduit that something gets out of order or an unusual obstruction is met with and it is desired to withdraw the machine.

LINE-CARRIER.—L. D. SHAFFER, Paint Borough, Pa. In the present patent the invention is an improvement in line-carriers, especially designed for use in stringing wires after the first wire has been strung, as well as for carrying wires, lines, and the like across an intervening space having a wire for supporting the device.

Railways and Their Accessories.

APPLIANCE FOR SHIFTING THE POINT OF APPLICATION OF THE WEIGHT ON THE TRUCKS OF CARS AND THE LIKE.—P. STEFFEE, Missoula, Mont. The invention is for the purpose of bringing the entire weight of the car body to bear on the driven wheels of the car truck or those wheels to which power is first applied in putting the car in motion. By this arrangement of means the traction of the driven wheel will be increased, thereby avoiding slipping and enabling the car to be started without delay. Using this appliance materially decreases the weight of the car-body and sanding the track will be seldom required.

RAILWAY SAFETY APPARATUS.—G. E. RYAN, New York, N. Y. The improvement refers to safety appliances or apparatus, and is intended to be used upon railways to prevent collisions. The arrangement is such that the