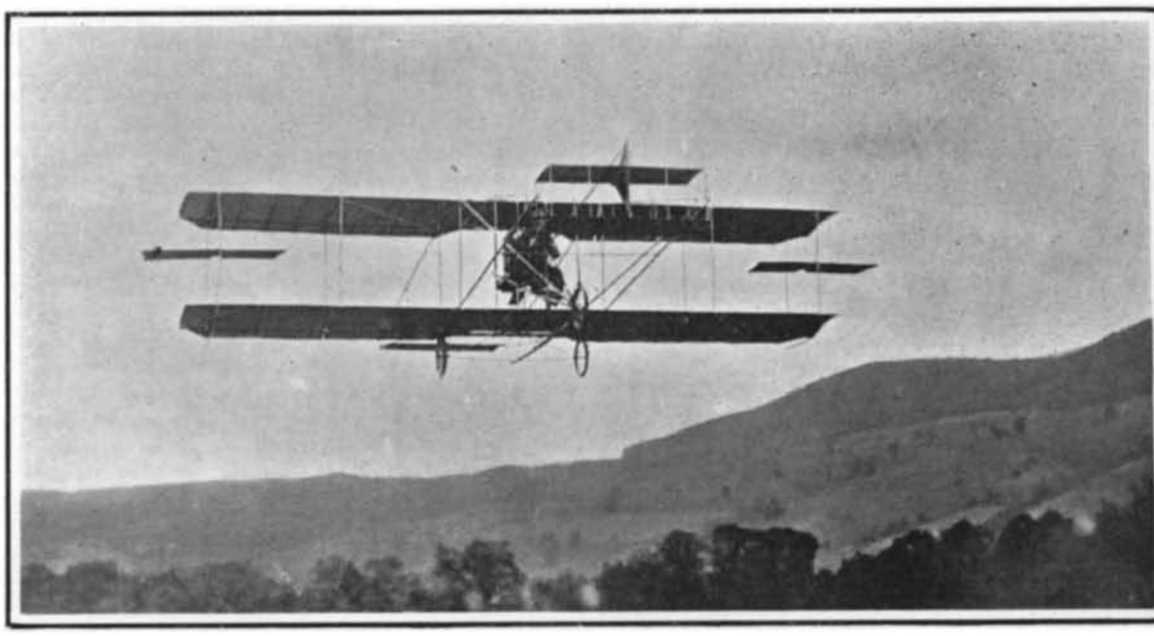
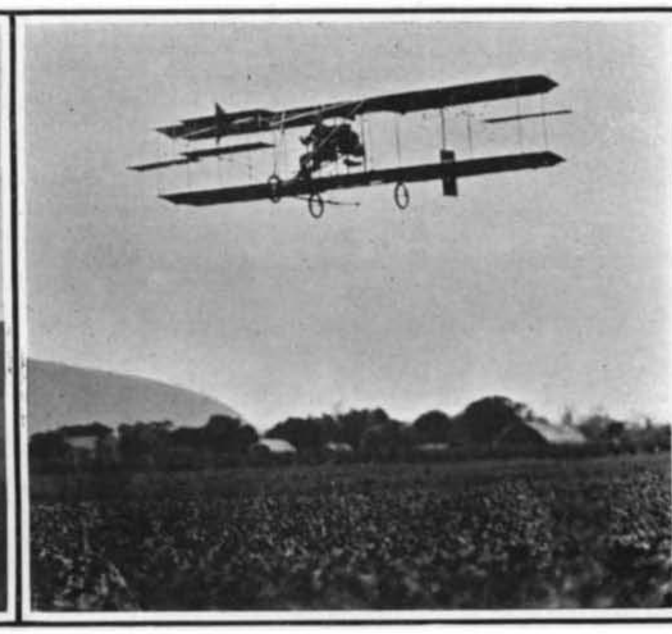
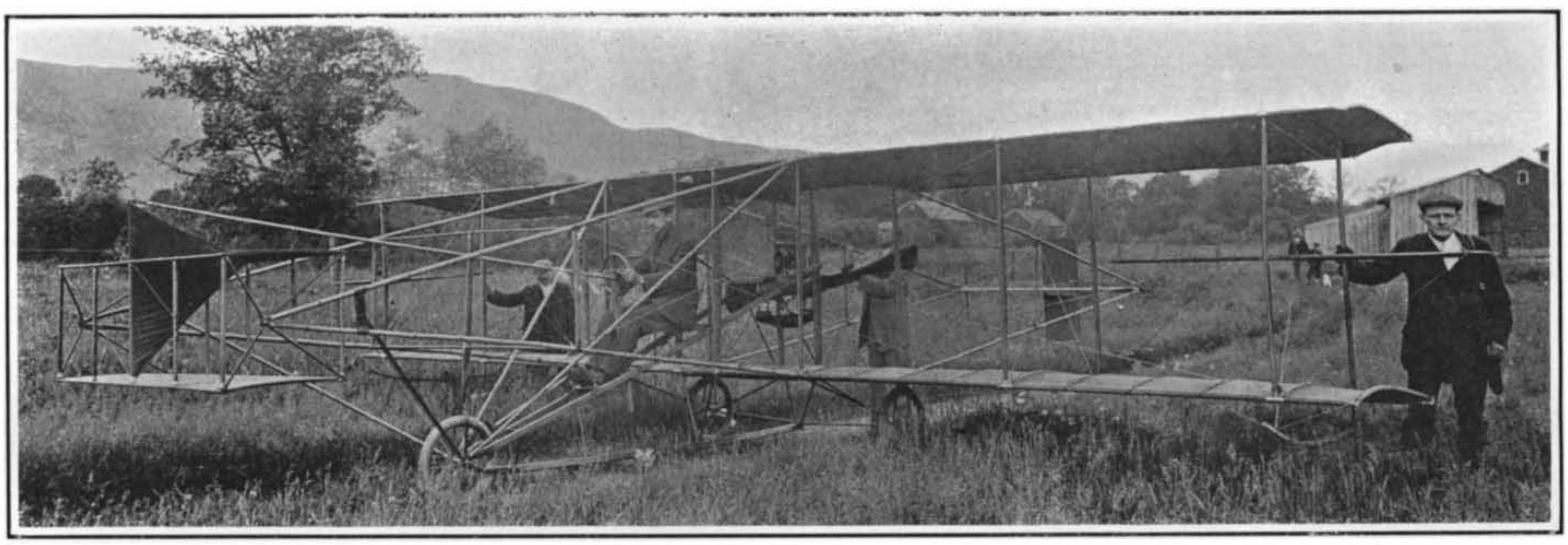
THE AERONAUTIC SOCIETY'S FIRST CURTISS AEROPLANE.

The photographs reproduced on this page show the new biplane which Glenn H. Curtiss has just completed for the Aeronautic Society. This machine, as can be seen from the pictures of it on the ground and in the air, is rather light and small compared with the Wright aeroplane or with most of the numerous biplanes lately constructed abroad. In constructing it, Mr. Curtiss has taken advantage of the practical experience in the art which he had in building the Aerial Experiment Association's four machines last year, while he has also had at his disposal the knowledge of Mr. A. M. Herring, who is now associated with him. The result is a greatly simplified and improved aeroplane and motor.

As with the "June Bug" and "Silver Dart," the planes are attached to a central body portion, mounted upon three 20-inch pneumatic-tired wheels, and carrying the motor and propeller. The two rear wheels are set in forks suitably braced and tied together, while the front wheel is mounted in a strong fork like that used on a bicycle. A single long struck diagonally by a wind gust. If such a gust were allowed to turn it, the gyroscopic action of the single propeller might direct it up or down. Movable balancing planes 2 x 6 feet in size are placed at the ends of the planes half way between them. These are operated by the swaying of the body of the aviator by means of a frame fitting around his shoulders. In fitting the rudders and tail, Mr. Curtiss has made liberal use of bamboo. This material combines strength with lightness, and it is surprising that it has not been used more in aeroplane construction. With the exception of Santos Dumont's tiny monoplane, we know of no other successful aeroplane in which bamboo rods are used to form part of the frame. The frames of the planes are of Oregon spruce, and are put together in sections. The ribs are of light laminated spruce spaced about a foot apart. They project beyond the rear members of the frames of the planes and run through pockets on top of the surfaces. A wire runs through the rear edge of each surface and is stretched over the end of each rib, thus serving to keep tight the cloth, which is also wrapped around the front edge of each plane. The

VIEWS OF THE CURTISS AEROPLANE MAKING ITS INITIAL FLIGHTS AT HAMMONDSPORT, N. Y.



THREE-QUARTER FRONT VIEW OF THE NEW CURTISS BIPLANE BUILT FOR THE AERONAUTIC SOCIETY.

A double horizontal rudder in front is balanced by a single horizontal tail. The 4-cylinder 25 horse-power motor, with radiator in front and propeller at the rear, is shown behind Mr. Curtiss, who is in the aviator's seat. Note the split vertical rudder behind and the fixed triangular vertical surface in front; also the balancing rudders between the planes at each end.

wood rod extends back from the front wheel to the axle connecting the rear wheels, which are spaced far apart.

The rubber-coated silk used for the surfaces is laced to the frame in panels, there being four 5-foot panels (two on each side of the 6-foot center one) to each plane. There are also 18-inch extensions on the ends of both planes, so that the total spread of the planes is 29 feet, while their width from front to back and their spacing is 4½ feet. On account of notches cut out of the planes to accommodate the propeller, the total supporting surface furnished by them is only about 250 square feet. A double-surface 2 x 6-foot horizontal rudder having 24 square feet of surface is placed 10 feet in front of the planes, while a single adjustable horizontal surface of the same size, located 10 feet behind them, serves as a steadying tail. The vertical rudder is placed at the middle of this surface; it is 2½ x 2½ feet in size. There is also a large vertical triangular-shaped steadying surface at the center of the horizontal rudder. This surface and the vertical rudder serve to keep the machine from twisting about its center vertical axis when surfaces have a slight parabolic curve from front to back, the curvature used being about 1 in 9. The angle of the planes with the horizontal is also slight, being only about 6 degrees as the machine stands on the ground. When in flight, this angle diminishes several degrees.

The motor used is a special 4-cylinder, 3¾ x 4, water-cooled Curtiss aeronautic engine. It develops 26 horse-power at 1,200 R. P. M., which is 1 horse-power per 1⅝ square inches of piston area, or rather more than is usually obtained. High compression is used, though this is by no means abnormal. The cylinders of the engine are of cast iron with a wall thickness of about 5/32 inch. They are surrounded by cast copper water jackets welded to them. The heads of the cylinders are hemispherical, with inlet and exhaust valves set at an angle upon each side of the water outlet, which is in the center. Both valves are operated by a single rocker arm pivoted on top of the water pipe. The inlet pipe extends across all four cylinders with the carbureter placed at one end of it. A gear-driven Bosh high-tension magneto

(*Concluded on page 468.*)

LOS ANGELES 200-MILE CONDUIT WATER SUPPLY.

BY DAY ALLEN WILLEY.

The longest artificial water conduit ever planned in America is that which is to increase the water supply of the city of Los Angeles in Southern California, and which is now being completed. While the conduit is notable for its engineering features, it will not only supply water for domestic purposes and for irrigation but the head of water is so great that it will produce electrical horse-power for pumping, manufacturing, transportation, and other purposes, so that the project achieves three different objects.

The extensive arid district in Southern California has limited Los Angeles in the past to obtaining water from only one source. The rapid growth of the city in population and its industrial development necessitated another supply, but the nearest considered available was from the Owens River. This stream, which rises in the eastern Sierras of the State, is over 200 miles from Los Angeles, and separated by a country which includes not only mountains but a large area of absolute desert, presenting many difficulties in the way of constructing such a canal. When the necessary surveys were made, it was found that it would be necessary to build a waterway no less than 215 miles in length. Incidentally, it may be said that the total cost of the project represents about $20,000,000, not counting the purchase of property for reservoir sites and other purposes, which, if included, bring the total cost to nearly $22,000,000. This sum has been provided by the sale of municipal bonds, and such has been the public interest manifested, that all of the money has been raised in the city of Los Angeles, its residents taking its securities.

The canal begins at a dam which has been constructed across the Owens River about 40 miles from a lake into which it has hitherto discharged its water. The dam is of the diversion type, and from it extends the main canal for a distance of 60 miles to the Haiwee, the first reservoir in the series planned. On this section is some very difficult work. In a distance of 22 miles the waterway includes no less than 8 miles of tunnel. Three and one-half miles of conduit are composed of heavy steel pipe faced on the outside with concrete. Ten miles of the canal in the same section have walls molded entirely in concrete. The Jawbone

(*Concluded on page 468.*)

IMPROVEMENTS IN THE DE FOREST SYSTEM OF WIRELESS TELEPHONY.

(*Concluded from page 457.*)

Dr. De Forest has made an ingenious application of the principle of directive propagation, a refinement of which has also been developed with great success in Europe by Bellini and Tosi.* It was found that if slanting wires were run from a mast to a boom, the intensity of the waves emitted would be much greater in the direction of the plane of the antenna and practically zero at right angles to it. Accordingly, this afforded them an excellent method of directing the waves; and if the whole arrangement were revolved, any desired direction could be given to the wave fronts emitted from the antenna. Dr. De Forest conceived the idea of using this device for sending out danger signals from a lighthouse or other point, and change the direction of the wave by revolving the projecting apparatus so that any boat which received the signals could immediately ascertain its direction from a danger spot equipped with the "aerophore," as the device has been termed, since the apparatus was designed to transmit intelligible signals which differed automatically with the constantly changing direction of the waves as projected. A simple example will illustrate this. When the apparatus is arranged to transmit waves in a northerly direction a certain telegraphic or telephonic signal would be sent out in that direction, and only in that direction. If that message were received on some ship, it would follow at once that the lighthouse was bearing due south of the vessel. For other points of the compass the signals would be different, while a prearranged code would be employed where the aerophore was installed upon a vessel. Thus with the apparatus in operation on both of two vessels, it would be possible as soon as they came within range of each other to determine their bearing, particularly as the signal is first received by an automatic and audible device, such as a buzzer, which would sound in the pilot house and make evident the necessity of picking up the telephone receiver and learning the exact direction of the signals. Dr. De Forest has recently been working on a type of aerophore where an arc light is revolved behind a parabolic mirror, with the movement interrupted successively at the points of the compass where the signal automatically is sent out by wireless, indicating the direction in which the wave is projected. In addition to these signals a microphonic transmitter is connected with a set of bells tuned to the quarters of the octave which are constantly striking, one after the other, several times a minute. These bells have a varying range of penetration, so that when the observer on a boat can hear four bells he knows he is within a certain range of distance of the source of sound. When only three are heard, the distance, of course, must be less, and so on, so that a fair estimate of the distance from the danger point is obtainable.

An improvement that makes possible the satisfactory working of the system is the adjusting of the sending mechanism of all instruments to a "common tune," which differs widely from that of the receiving part of the apparatus, so that when using a single antenna, it is possible to receive the sound whether the transmission apparatus is working or not. When a signal is received, a small lamp is lighted by induction or a buzzer is caused to sound, so that the operator immediately puts on his head telephone in order to find the whereabouts and name of the transmitting station. Aerophore signals will be erected at all the points of danger on the Great Lakes, and will be used on all the signal towers of the Radio-Telephone Company. The device has been tried on the steamship "Wisconsin," and has worked successfully over a limited range.

* See Scientific American Supplement, No. 1745, June 12th, 1909, page 372.

THE AERONAUTIC SOCIETY'S FIRST CURTISS AEROPLANE.

(*Concluded from page 460.*)

weighing 12½ pounds, as well as a gear-driven oil pump, is placed at the same end as the carbureter, while the gear water pump is at the other, or rear, end. One of the gears of this pump is on the camshaft. The motor is very light and compact, its weight complete with pumps, magneto, and carbureter being 97½ pounds. As it is claimed to be capable of developing as much as 30 horse-power, its weight without water and radiator is about 3¼ pounds per horse-power. The radiator weighs 40 pounds, and less than 10 pounds of water is carried, so that the total weight of the power plant is under 150 pounds. It was tested by a 10-hour run driving the propeller.

A 6½-foot diameter, 5-foot pitch wood propeller is mounted upon the engine crankshaft. This propeller develops a thrust of 225 pounds when the aeroplane is held stationary, although 150 pounds is all that is needed to fly it. The blades are but five inches wide. The motor is mounted upon the rear part of the main planes, half way between them, the propeller being at the rear. The aviator sits on a seat at the front edge of the lower plane and about a foot above it, this seat and a foot rest being located upon a pair of inclined braces extending upward from the front wheel to the two special uprights at the rear, which support the motor bed in conjunction with the inclined braces. Two other pairs of braces extend upward respectively from this wheel to the front edge of the upper plane and to the parallel downwardly-inclined poles extending forward from the front edge of this plane to support the horizontal rudder. The tail is carried by two pairs of parallel rods extending downward and upward from the rear edges of the upper and lower planes and meeting some 12 feet behind them. A square automobile-type radiator is placed in front of the motor; the cylindrical gasoline tank is located above it just under the upper plane, and the oil reservoir below.

The control of the new aeroplane is practically as simple as that of an automobile. All the aviator has to do is to pull or push on the steering wheel, which is placed vertically in front of him, in order to steer up or down, while turning the wheel and inclining the body slightly steers the machine to the right or left. The vertical rudder is in reality unnecessary for steering, as this can be accomplished simply by inclining the body and thus setting the balancing planes. These are connected by wires with a frame of steel tubing shaped like a bicycle handle bar and fitting around the shoulders of the aviator, so that when he sways slightly to one side or the other one wing tip is inclined upward and the other downward slightly. The aeroplane, in a run of 75 feet, will attain sufficient speed—about 25 miles an hour—to rise. It flies at more than 40 miles an hour. A plunger brake is fitted to the front wheel tire, to aid in quickly stopping it when it alights.

Several successful trial flights were made at Hammondsport, N. Y., by Mr. Curtiss on June 4th, 5th, and 6th. The longest of these was about 3 miles in the shape of a figure 8. He has shipped the machine to the grounds of the Aeronautic Society at Morris Park race track, New York, and after making some further practice flights, he will attempt to set up a record for the Scientific American trophy at the society's first 1909 flight exhibition, which will be held either the 19th or 26th instant. A new monoplane and several new gliders will also be tried upon this occasion. There will be a wind wagon race, and contests for models, kites, and gliders. The society's new dirigible balloon will also be flown.

LOS ANGELES 200-MILE CONDUIT WATER SUPPLY.

(*Concluded from page 460.*)

division, as it is called, is uninhabited, and it was necessary to transport much of the machinery and all of the food supplies as well as the building material from the desert and mountains in wagons, necessitating the construction of an extensive mileage of roadway.

The tunnels which have been required on the route are notable for their extent. The Coast Range of mountains is pierced by a tunnel, nearly 11 feet in diameter, which is nearly 27,000 feet in length—one of the longest in America. In this tunnel and its approaches, covering a distance of 11 miles, there is a fall from 2,922 feet altitude to 1,520 feet. The head of water thus obtained will be utilized in an electric power plant of 93,000 horsepower at what is known as Elizabeth Lake. This will be by far the largest power plant in connection with the project. Another tunnel is 7,800 feet in length. The conduit does not extend into the city of Los Angeles; but its water is distributed to a series of reservoirs in San Fernando Valley. These reservoirs have a capacity of about 35,000 acre feet, a supply sufficient to serve the needs of the city for a period of several months even in the dry season.

The development of the water power and its use are notable features of the project which is being carried out. As already stated, several stations are being constructed upon the route at suitable sites. Machinery in some of them has been installed for operating the machinery of the cement mill which has been erected for supplying this material to the project; for the operation of several tramroads for carrying material; and also for dredging a lake which is located on the line, the dredge being constructed especially for this purpose, and operated entirely by electric power. The current is also to be utilized in serving a series of large electric pumps, as the supply of water is ample not only for the city, but for irrigation on an extensive scale. It is calculated that at least 20,000 acres of what is at present unproductive land in this section of California will be reclaimed for the planting of fruit, vegetables, and grain. It might be added that the transmission system from the generating stations to the points of distribution will be about 120 miles in length. In fact, the line is one of the longest in the world, and the current of 75,000 volts is the highest ever attempted over such a length of cable. The concrete-incased pressure main which leads the water to the main power house—a gradually tapering pipe, so as to accelerate the force of the water at the turbines—is the first of the kind ever put in use. Furthermore, the conduit which carries the water to this pressure main is the longest tunnel system in use for this purpose.

Construction was commenced on the eastern section, as it was realized that the tunneling and closed conduits would require so much more time than the open canal. The section in the Jawbone district has been by far the most difficult to complete, for the rock work here comprised nearly nine miles and included no less than twenty tunnels. These tunnels are connected by short redwood flumes, but to all intents and purposes they constitute one continuous underground conduit.

A reference to the headworks and the tunnel system makes clear the entire scheme. A dam, thrown across the canyon at the intake, backs the water up for over a mile, forming a large reservoir, from which the water flows into the tunnels in sufficient quantity to fill them to their required depth of 6 feet 6 inches. From this point the river, in the 12 miles to the power house, drops by a succession of falls and steep grades almost a thousand feet; but the tunnel grade has a fall of only 8 feet to the mile, the total fall to the forebay being only 68 feet. Thus, instead of the waters following their natural course far down in the gorge to the floor level of the power house, they are run through the gravity conduit high above the bed of the river, emerging from

(*Continued on page 471*).

Harrow, L. F. Wheeless 924,517
Hat body and making the same, Wollner & Eiseman 924,408
Hat container, lady's, F. Young 923,924
Hats, means for facilitating the circulation of air under, L. Morigi 923,986
Hay rake and cocker, W. C. Trussell 924,297
Hay rake and loader, C. Bornholdt 924,035
Headache, appliance for relief of, J. M. Blashfield 924,596
Headlight operating means, E. C. King 924,557
Heater, F. Buehring 924,315
Heating air or other gases, apparatus for, W. R. Wood 924,409
Heating and mixing plant, F. O. Blake 924,132
Heating furnace, continuous, H. E. Smythe 924,009
Heating medium for scientific and similar apparatus, means for automatically regulating the supply of, G. S. Edelen 923,957
Heating system, duplex, E. H. Gold 923,968
Hinge, C. F. Anderson 924,412
Hinge, gate or door, C. W. Cook 924,430
Hinge, spring, E. Bommer 924,422
Hoe and weeder, garden, J. S. Worcester 924,124
Hoisting and conveying apparatus, W. M. Shaw 923,899
Hoisting or carrying mechanism for barns, M. S. Yoder 923,923
Horseshoe, M. T. Keenan 923,941
Horseshoe calk plate, O. F. Peterson 924,580
Horseshoe calk, removable, D. A. Shaffer 924,586
Hose coupling, R. S. MacEwan 924,166
Hosiery, manufacture of fashioned, A. Gee 924,605
Hub, vehicle, W. R. Wilson 923,919
Huller. See Pea huller.
Hunting knife, D. H. Holman 924,070
Hydrant, hose, C. C. Corlew 924,041
Hydrocarbon burner, Stamps & Singer 924,012
Hydrocarbon motor, F. L. Nichols 924,100
Hydropneumatic wheel, Oudinot & Putois 923,881
Ignition regulator, automatic, E. D. Waldron 924,119
Implement handle, auxiliary, C. P. Paulsen 923,994
Internal combustion engine, W. E. Struss 924,116
Internal combustion engine, R. A. Reynolds 924,382
Invalid lifter, swing, and wheel chair combined, C. F. Moore 924,177
Iron heater, F. L. Miller 923,983
Jacquard mechanism, J. A. Groebli 924,454
Jar cover, Strachan & Campbell 924,401
Joint. See Floor covering joint.
Joint coupling, universal, F. Pianso 924,187
Joint device, expansion, F. Seiffert 924,279
Keyhole guard, R. J. Copeland 924,321
Knit fabric having elastic selvages, H. C. Shaw 924,385
Knockdown box, A. M. Wight 923,920
Label affixing device, bottle, S. B. Goff 924,343
Labeling machine, can, J. Barrow 924,129
Ladder, extensible, A. F. Cralle 923,815
Lamp, M. I. Cohen 924,600
Lamp and lantern, H. E. Harbaugh 923,970
Lamp bracket, vehicle, Ehlen & Kirkendall 924,045
Lamp bulb guard, G. L. Brisbin 924,312
Lamp, inverted incandescent gas, J. W. Hosler 923,972
Lamp oscillator, G. Printup 923,996
Latch bolt dogging mechanism, A. Arens 924,528
Lavatory, W. Bunting, Jr. 924,598
Lawn sprinkler, B. F. Wooding 924,519
Leer charging apparatus, Hubbell & Morris 924,356
Level, automatic, J. J. Garrett 924,340
Life-saving device, F. C. Bargar 923,801
Light fixture shade, P. J. Handel 924,457
Line casting machine, J. R. Rogers 924,000, 924,001
Line casting machine, L. L. Kennedy 924,243
Line holder, C. W. Wilson 924,026
Liquid heating and cooling apparatus, A. Jensen 924,233
Liquid purifying apparatus, F. P. Smith 924,285
Liquid separator, automatic, O. Zerkowitz 924,524
Liquids and gases chemically active upon each other, apparatus for simultaneously treating, J. Stevnis 924,592
Lithographic presses, blanket for, F. A. Tessmer 924,016
Loader, R. A. Ogle 924,184
Lock, R. Feola 924,331
Lock and latch, combination, W. T. Blount, Jr. 924,421
Locking device, drawer and tray, W. H. P. Feely 924,225
Loom, W. R. Burrows 924,142
Loom, W. J. Garlick 924,339
Loom side protector, Goulet & Lamarre 924,451
Loom thin-place preventer, J. T. Rutledge 924,190
Lubricating washer, C. E. Palmer 924,265
Lubricator, J. Sherry 924,588
Mail bag catching and delivering mechanism, W. C. Miller 923,872
Mail box, H. P. Davis 923,818
Mail carrying apparatus, L. W. Westcott 924,206
Mail delivering and receiving apparatus, W. Kreanner 923,977
Mail delivering and receiving apparatus, W. O. Massie 924,085
Mail receptacle, J. W. Cutler 923,816
Match box, P. J. Wurzburger 924,522
Match box and cigar cutter, combined, W. H. Webster 924,022
Match safe, S. Whitcomb 924,407
Measuring and weighing machine, B. P. Mulloy 924,570
Measuring apparatus, torsion, W. H. Kenerson 924,242
Mechanical movement, W. S. Taylor, Jr. 924,509
Medicine cabinet, J. W. Hunt 924,468
Merry-go-round, B. F. Fitch 924,155
Metal cutting apparatus, N. H. Davis 923,954
Metals by the wet method, electric dissociation of, A. Levy 923,864
Meter statement delivery apparatus, R. W. Gallagher 924,158
Micrometer, A. Nielsen 932,880
Milking machine, L. Holt 924,229
Mill and method for rolling tubes, M. F. Capron 923,944
Mining timber, reinforced concrete, J. A. Elliott 924,153
Mold, L. D. Irish 924,553
Molding apparatus, Danver & Lose 924,436
Molding machine, R. C. Meyers 924,366
Mortising tool or chisel, O. L. Smith 924,199
Motion, mechanism for converting reciprocating into rotary, O. Schoell 924,003
Motor control, electric, D. C. Jackson 923,973
Motors, apparatus for injecting fuel into internal combustion, F. Durr 924,044
Mower cutter, lawn, A. B. Case 924,318
Mud guard, B. L. Jones 923,849
Muffin pan, H. R. Wolfer 924,209
Music leaf turner, J. F. Dickson 924,042
Musical instrument, brass, J. Low 924,250
Nail setter, C. A. Gehne 924,054
Needle shower, I. G. Dimond 924,602
Nest trap, G. H. Gaw 923,829
Nut lock, T. M. Mills 924,259
Nut lock, B. Humphrey 924,467
Oar, H. Chaussinand 923,945
Oil burner, H. H. Ashlock 924,216
Oil burner, self-cleaning, P. K. Morcom 924,566
Oil cup, W. L. Morris 924,487
Oiling device, belt, C. Benson 924,417
Ore jigger, W. M. Williams 923,917
Ore separator, C. M. Mullen 923,988
Ores, reducing, F. M. Becket 924,130
Overalls, J. Stecker 924,013
Oxygen from air, separating, G. M. A. Claude 924,428
Package, T. D. Richardson 924,275
Package tie, D. Comfort 924,146
Package tie, J. Bennor 924,594
Packing, C. C. Puffer 923,890
Packing, lubricating, Stewart & Carr 923,908
Pad. See Collar pad.
Paper bottle closures, making, C. F. Jenkins 924,555
Paper box blank cutting machine, F. Girond 924,607
Paper boxes and similar articles, closure for, P. B. Myers 924,094
Paper machine, H. J. Meader 923,870
Paper, etc., machine for mounting sheets of, E. Jagenberg 924,163
Papering apparatus, O. O. Carey 924,317
Papering machine, D. Krapf 924,361
Pea huller and separating machine, M. T. Freeman 924,447
Pencil case and other cylinder, A. Walker 924,406
Phonograph record cabinet, W. C. Nickerson 924,493
Phonograph stop, F. H. Andrews 924,527
Photographic apparatus, H. Hubscher 924,465
Piano action, L. N. Soper 924,394
Piano fall board, J. R. A. Lang 924,247
Piling, interlocking sheet metal, S. T. Fiero 924,442

the tunnels in the forebay, 87 feet above the power house, to which they pass through the immense pressure main to the impulse wheels of the generators. Carrying their full load, the tunnels have a capacity of 410 second feet, or 20,500 miner's inches. The conduits leading from the forebay to the power house are steel tubes, which taper from a maximum interior diameter of 90 inches to a minimum interior diameter of 28 inches. The thickness of the shell of the piping is 3/16 of an inch where it has a solid rock backing; but where it leaves this formation, and has only the steel to depend upon for withstanding the pressure of the water, the interior diameter is decreased to 72 inches, and the thickness of the pipe is increased to 1⅜ inches. Over one million pounds of steel were used in its construction.

The pressure main was built in 10-foot sections, which were hoisted over an aerial tramway to the top of the hill, and from there conveyed to an inclined shaft, where they were lowered into place. As each length was riveted, the work taking from ten to twelve hours, the iron workers left and their places were taken by the concrete molders, who formed the concrete casing around the pipe.

The head of water of 877 feet gives a pressure at the impulse wheel of 380 pounds to the square inch. The power is generated in four units, each unit operated by two overhanging impulse wheels carrying eighteen brass buckets. Each impulse wheel is set in a separate masonry compartment which opens directly into the tailrace, where the water is measured before it is returned to its natural channel.

An idea of the immense quantity of material needed for the project is given, when it is stated that the cement alone required amounted to 1,300,000 barrels. Fortunately, large deposits of sand and limestone were found in the Owens River district, and the builders were enabled to manufacture concrete along the route, the largest cement mill having a capacity of 1,000 barrels daily. The volume of water carried by this route will average a flow of over 400 cubic feet a second. The source of the supply, however, the Owens River, is one of the principal water courses in eastern California, and measurements by instrument, which were taken for a considerable period before the work on the conduit commenced, proved that the volume of water it carries is sufficient for the purpose even in the dry season of each year.

The chief engineers of this notable project, and the man to whom the bold scheme for directing the Owens River across the State is due, is Mr. William Mulholland of Los Angeles, who spent several years in looking over the proposition and preparing plans. He is assisted in the construction by Mr. J. B. Lippincott, formerly in the United States Irrigation Service.

It is interesting to remark that the motion of the solar system plays an important part in the shifting panorama of the heavens. Not only do the stars move onward, but the sun, moving also, carries us continually northward, so that our point of view is ceaselessly changing, and looking out from the flying earth, we are like people on a ship which is passing by a squadron of other ships. Their evolutions cause them to appear in constantly changing relations to one another, and at the same time our own motion, shifting the line of sight, produces other changes of view, which increase the complexity of the apparent movements. In short, we are reminded of the remarkable resemblance of the universe to the modern conception of an atom, in which the restless corpuscles are speeding in all directions, so that an infinitesimal being, inhabiting one of those corpuscles, would see the other corpuscles shaping themselves into constellations that would be as unenduring as are the figures that the poetic imagination traces among the stars.

Stone press, artificial, J. Draenert 924,540
Stopper puller, E. Sanborn 923,897
Storm shield, A. L. Brown 924,424
Stove, furnace, and the like, H. Gerdes 924,548
Stove, gas, M. O'Brien 924,183
Strength testing apparatus, J. L. Perkins 924,579
Strength testing machine, C. W. Putnam 924,625
Stress indicator, W. P. Chapman 924,427
Striking bag platform, portable, P. G. Armitage 923,928
Stropping device, J. Schnure 924,278
Suction apparatus, hydraulic air and other gas, W. J. Frame 924,335
Surgical bead holder, S. M. Langworthy 923,862
Swing, W. Johnson 923,974
Tack puller, insole, L. G. Freeman 923,828
Tank float, F. M. Stevens 924,398
Telautograph, G. S. Tiffany 924,512
Telegraphic receiving tape, P. B. Delany 924,538
Telegraphy, wireless, R. A. Fessenden, 923,962, 923,963
Telephone attachment, R. E. Pedigo 923,882
Telephone cables, distributing terminal for, F. J. Beaucond 923,933
Telephone exchange system, J. L. McQuarrie 923,993
Telephone ringer, J. A. Birsfield 924,030
Telephone transmitter mouthpiece, M. S. Hufschmidt 924,072
Telephone transmitters, antiseptic attachments for, E. B. Crosby 923,950
Telescopes, focusing cap for, H. C. Mustin 924,488
Tempering furnace, electric, V. Royle 924,109
Thermometer bulb protector, A. Roesch 924,276
Thermoplastic compound and making same, B. B. Goldsmith 924,057
Thermostat controller, J. McCartin 924,095
Thionous precipitation, G. C. Westby 923,916
Thread cutting tool, B. Borden 924,221
Tie, track fastener, and brace, J. J. Griffin 923,969
Tightening device, H. English 923,960
Tile greenhouse bench, D. F. Wise 923,921
Tile machine, H. H. Gibson 924,450
Tire casing, J. F. Palmer, 924,186, 924,267, 924,268, 924,571
Tire for vehicles, removable, A. M. Condit 924,429
Tire, metallic, G. E. Fortescue 924,156
Tire plug, R. Sampson 922,896
Tire, pneumatic, F. H. Perry 924,102
Tire, pneumatic, J. F. Palmer 924,572
Tobacco box and cutter, combined, H. C. Moses 924,569
Tobacco pipe, G. D. W. Schmidt 924,192
Tobacco, treating, F. S. Smith 924,284
Tongue, wagon, F. A. & N. C. Long 924,480
Tool, electropneumatic, W. Z. Ward 923,913
Tools, making hand, G. E. Wood 924,210
Train stopping device, J. E. Maloney, et al. 924,482
Transportation receptacle for dead human bodies, C. L. Barnes 924,029
Trolley hanger, W. H. Kempton 923,851
Truck, elevating, W. H. Cadwell 924,143
Truck, hand, A. W. Young 924,523
Trunk, S. W. Bonsall 923,807
Tubes, apparatus for automatically perforating, C. Thibodeau 924,203
Turbine, G. H. Cook 923,947
Turbine, W. L. R. Emmet 924,546
Turbine, elastic fluid, C. Roth 924,108
Turbine, steam, A. Bonom 924,309
Type for typewriting machines, etc., machine for making dies for the manufacture of, L. A. Diss 924,539
Type making machine, W. G. Reynolds 923,998
Type setting and line casting machine, H. Degener 924,326
Typewriter line spacing mechanism, F. H. Ward 924,021
Typewriting machine, F. X. Wagner, reissue 12,970
Typewriting machine, W. J. Roche 923,893
Typewriting machine, H. Crutchley 923,951
Typewriting machine, G. A. Seib 924,006
Typewriting machine, J. C. McLaughlin 924,096
Typewriting machine, J. Sinisi 924,198
Typewriting machine, J. F. Allard 924,525
Typewriting machine, G. H. Smith 924,590
Typewriting machine, E. E. Strong 924,593
Typewriting machine, Gibbs & Sokolov 924,606
Typewriting machine erasing device, G. K. Andrews 924,215
Umbrella, J. Beaudry 924,530
Valve, Breth & Campbell 923,808
Valve, C. Wilson 924,207
Valve apparatus for tanks, L. A. Cornelius 924,432
Valve, automatic shut off, C. D. Miller 924,257
Valve controlling device, hygrometric, W. S. Johnson 924,235
Valve device, M. Garl 924,159
Valve for water tanks, E. A. Naslund 923,878
Valve gear, M. Berg 923,935
Valve, high speed reducing, W. V. Turner 924,018
Valve locking device, E. A. Brandenburg 924,423
Valve seat refacing device, R. Netter 924,369
Valve, throttle, Kindig & Dexter 924,080
Valve, water supply, H. Gardenier 924,052
Vanner, G. B. Shipley 924,589
Vehicle wheel, Bradley & Fairchild 924,139
Vehicle wheel, J. R. Fouch 924,334
Vehicle wheel, L. A. Hill 924,614
Vehicle wheel, cushioned, W. C. McCarty 924,621
Vending machine, coin controlled, R. F. Emmerich 923,958
Vending machine, coin operated, C. M. Linde 924,252
Vending machine ejecting device, J. E. Allison 924,526
Veneer press, W. R. Snyder 924,591
Ventilator. See Window ventilator.
Ventilator, G. G. Loebler 924,479
Vessels charged with volatile liquids or liquids under pressure, closure for, Paulard & Grillet 924,496
Wagon body lifter, W. P. Lucas 923,980
Wagon, dumping, J. D. Bunn 923,943
Washboard, D. Hughes 924,466
Washboard soap holder, R. E. Toy 923,911
Washpan, P. Schlueter 923,984
Washing machine, G. A. Post 923,888
Washing machine, J. H. Pearson 924,578
Washing machine gearing, H. W. Darrow 923,819
Water elevator, H. Z. Hoylman 924,071
Water gage, H. R. Fay 924,050
Water heater, W. A. Pratt 924,105
Water meter, P. A. McGurrin 923,992
Water motor, W. J. White 924,300
Water motor, impact, R. M. Dobbie 924,150
Water supply apparatus, T. Smith 923,905
Water wheel bucket attachment, W. R. Eckart 924,544
Wave motor, C. E. Edwards 923,823
Weather strip for doors, B. E. Cox 924,434
Weed cutter, J. J. Smith 924,392
Weed destroyer and gatherer, B. Pomije 924,498
Weighing apparatus for liquids, automatic, J. P. Baldwin 924,220
Weighing machine, W. S. Scales 924,191
Welts, material for waterproof, J. R. Reynolds 924,106
Wheat, machine for separating cockle from, C. P. Ballard 923,932
Wheelbarrow, A. N. Faulkner 924,547
Whiffletree fender, E. N. Smith 924,389
Windmill, E. Hards 924,060
Window balcony, J. P. Roger 924,189
Window fixture, T. J. Corken 924,431
Window screen, W. H. Millis 924,258
Window ventilator, C. O. Meurk 924,365
Wire connector, Callahan & Eskridge 924,426
Wire stretcher, F. Davis 923,817
Woodworking machine, D. S. Courtney 924,536
Woodworking machines, rotary cutter for, C. Karpp 924,240
Work holding means, E. W. Morehouse 924,178
Wrench, W. E. Piper 923,886
Wrench, J. G. Paterson 924,269
Wrench, H. T. Bush 924,292
Wrench, L. Forsythe 924,444
Writing machine, E. B. Hess 924,460

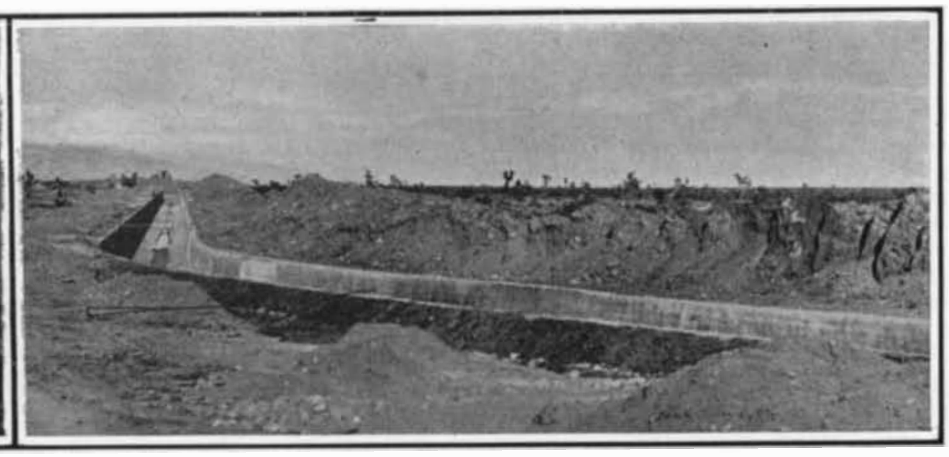
A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents, provided the name and number of the patent desired and the date be given. Address Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list. For terms and further particulars address Munn & Co., 361 Broadway, New York.

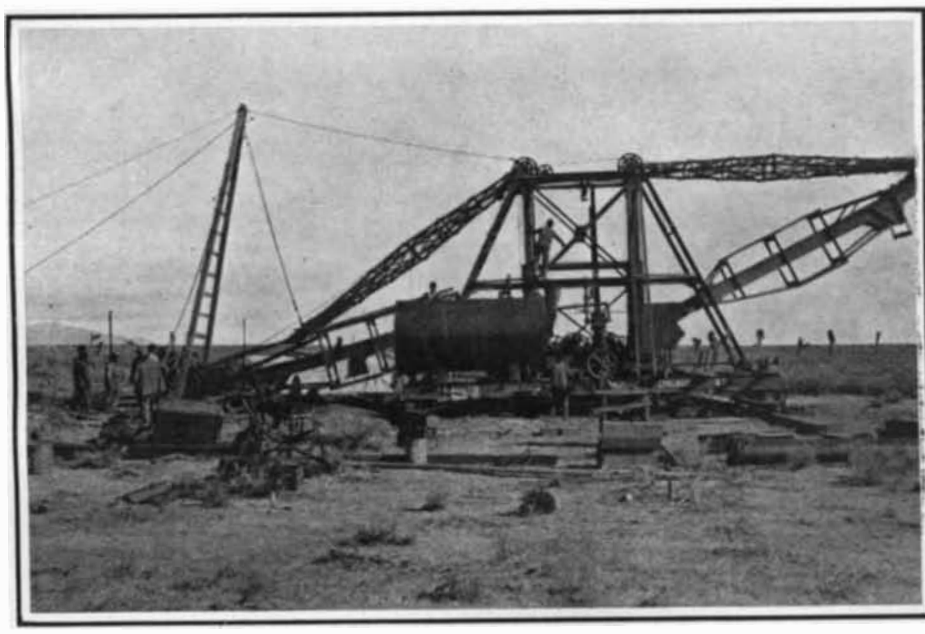
SEALED PROPOSALS.

SEALED PROPOSALS will be received at the office of the Light-House Engineer, Tompkinsville, N. Y., until 1 o'clock P. M., June 28, 1909, and then opened, for furnishing materials and labor of all kinds necessary for the construction and delivery of a light-house at Staten Island Rear Range Light-Station, Ambrose Channel, New York, in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to the Light-House Engineer, Tompkinsville, N. Y.

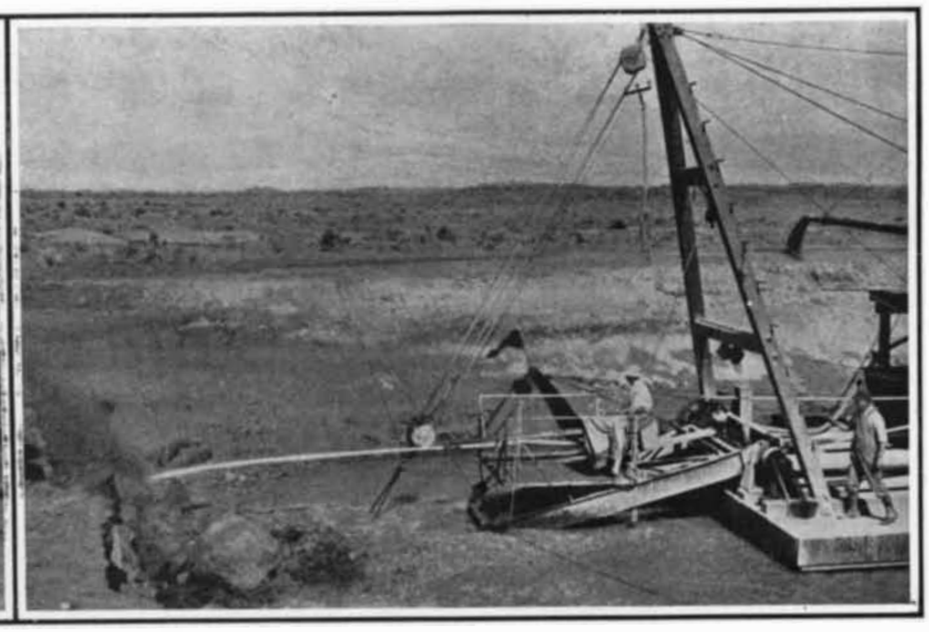
View of Sierra Nevada range, showing part of the watershed of the Owens River.



A mile of completed aqueduct through the level desert.

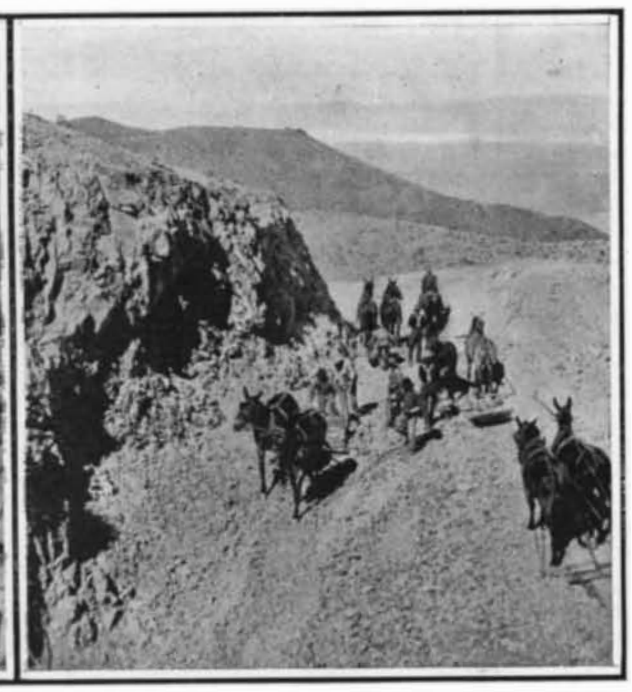


One of the great excavators at work. This machine excavates to the exact shape of the aqueduct and does 150 feet or better per day.



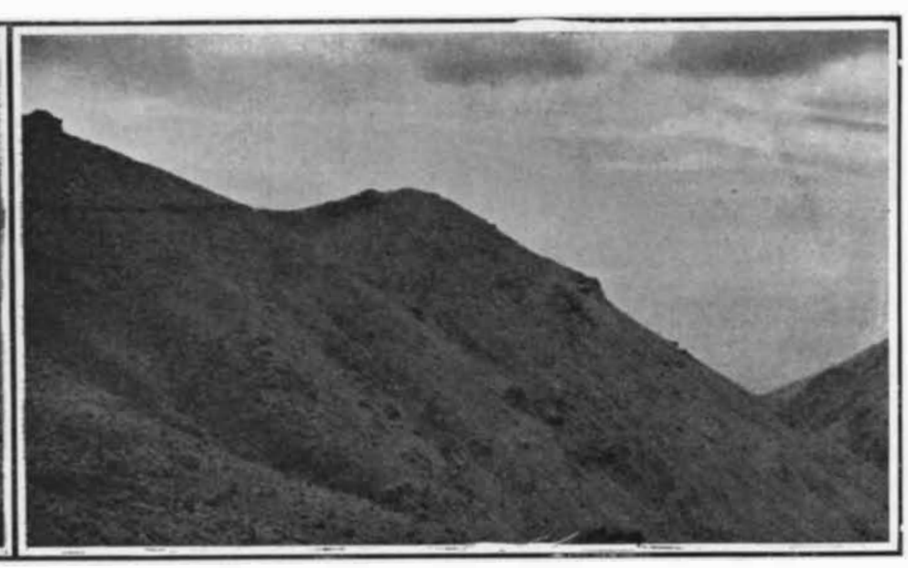
Dredges at work on the canal near the intake in Owens Valley.

Kilns and other machinery of the aqueduct. Cement plant at Tehatchapi, Cal.



Building roads in the Jawbone section.

The completed aqueduct with its concrete cover. A typical piece of work along the line of the conduit.



The upper depression shows the aqueduct excavation ; 1,200 feet below can be seen the Mojave Desert.

LOS ANGELES 200-MILE CONDUIT WATER SUPPLY.