any great extent though known to be rich. The efforts of individual miners being desultory and contracted owing to the difficulty of controlling the too copious flow of water, which was utterly beyond the limited mechanical ability of the placer miner to dispose of. Bedrock, where the richest deposits lay, could not be exposed without some powerful mechanical auxiliary to eject the overwhelming floods. Neither was the value of the deposits great enough to stimulate the expenditure of all the labor required in order to secure it, for the average of gold throughout the basin does not exceed 30 cents a cubic yard.

These obstacles were effective in discouraging individual attempts and reluctantly the miner concluded that the problem was beyond his solution and one which could only be solved by mechanical means. Since then inventive genius has exercised its utmost efforts to overcome the difficulty, but met with no success until within three years past. The region is the grave of a hundred abortive inventions. Mining experts who had exhaustively studied the situation agreed that the extraction of gold could be effected by dredging, provided a process of the required power for working immense masses of material containing such low values as here existed and at a cost that could afford a margin of profit, could be introduced, the aim being to construct a dredger that would excavate, wash, sluice, handle and discharge the waste gravel at a continuous and single operation, to pick up, digest and eject in the same movement. Experimental effort was exhausted on all known methods of gold dredging with but a measure of success, and it was not until 1898 that the difficulties were finally overcome.

The single bucket dredger has been transformed into those astonishing and complete mechanical devices by which the riches of the Oroville district are being made available. To stand by these powerful machines and observe the ease with which great masses of soil containing bowlders, some weighing 100 pounds, are torn up from depths of 30 feet by buckets attached to a chain having a tensile strength of 500 tons, each bucket containing 4, 5 or 6 cubic feet and then carried over a gantry 19 feet 6 inches in height, where it is dumped into a hopper and, after being washed, carried into a revolving, perforated cylinder, where the fine dirt is dropped into the sluice boxes below and the coarse gravel and bowlders are passed to the conveyor and automatically carried to the rear. Like the bucket chain which is adjustable to greater or lesser depths, the conveyor or tracker can deposit its load to a height, if necessary, of 35 feet above the ground.

The work of the dredger never ceases, but for cleaning sluice boxes. The average amount of earth handled is, according to the size of dredger, from 1,000 to 3,000 cubic yards each day. The monthly capacity of the largest is one acre to a 30-foot depth per month. The cost is 5 cents for each cubic yard, and the estimated expense for running a dredger of the first class, $1,800 to $2,000 a month. One of the great dredgers in use by the Leggett Wilcox Company was made by the Risdon Iron Works and is now operating in "tight" ground, and for that purpose is of extra strength. It will dig from 30 feet below to 15 feet above water level. The ladder consists of a heavy lattice girder with ½-inch side plates 3 feet deep. The bucket chain carries 32 heavy buckets of 5-foot capacity. The main gantry is of steel, 19 feet 6 inches high. The bucket belt dumps 12½ buckets a minute, or 150 cubic yards an hour, and is driven by a 50 horse power induction motor. The material is dumped into a steel delivery plate which conveys it to the revolving screen. Under the delivery plates are three sets of bar grizzlies. The revolving screen is 4½ feet in diameter and 25 feet long, perforated with ⅜-inch holes. The water supply is furnished by two centrifugal pumps, one delivering 2,000 gallons a minute into the screen through a perforated pipe, and the other supplies water into the distributing box. The gold and fine material passes through the perforated screen into the distributing box and over 300 square feet of standard tables. The sand and small gravel is then delivered behind the dredge by a sluiceway.

The Bucyrus dredger, operated by the same company, is of somewhat larger capacity, and is working efficiently in "loose" ground, which it handles at the rate of 3,000 cubic yards each 24 hours. The distinctive feature of this dredger is the close-connected bucket principle, and also the peculiar shape of the buckets, which admit of side digging. The conveyor belt is of rubber. The dredger is driven by a 110 horse power motor, and the buckets hold each 5 cubic feet.


No. 713,316.

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Whereas John Henry Doe & William Paul Roe of Paris, France

HAS PRESENTED TO THE Commissioner of Patents A PETITION PRAYING FOR THE GRANT OF LETTERS PATENT FOR AN ALLEGED NEW AND USEFUL IMPROVEMENT IN

Electric Accumulators,

A DESCRIPTION OF WHICH INVENTION IS CONTAINED IN THE SPECIFICATION OF WHICH A COPY IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND HAS COMPLIED WITH THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED, AND

Whereas UPON DUE EXAMINATION MADE THE SAID CLAIMANTS ARE ADJUDGED TO BE JUSTLY ENTITLED TO A PATENT UNDER THE LAW.

NOW THEREFORE THESE Letters Patent ARE TO GRANT UNTO THE SAID John Henry Doe & William Paul Roe, their HEIRS OR ASSIGNS FOR THE TERM OF SEVENTEEN YEARS FROM THE twenty eighth DAY OF October ONE THOUSAND NINE HUNDRED AND two THE EXCLUSIVE RIGHT TO MAKE, USE AND VEND THE SAID INVENTION THROUGHOUT THE UNITED STATES AND THE TERRITORIES THEREOF.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington this twenty eighth day of October in the year of our Lord one thousand nine hundred and two and of the independence of the United States of America the one hundred and twenty seventh.

F. I. Allen
Commissioner of Patents.

PATENT OFFICE UNITED STATES OF AMERICA

FAC-SIMILE OF THE NEW UNITED STATES LETTERS PATENT.

A dredger known as the Marion steam shovel has been introduced and is in successful operation.

Altogether there are now fourteen of these great dredges operating in the Oroville basin, with six others under construction, which will give a dredging capacity of twenty, handling 35,000 cubic yards of earth daily.

None of the dredges of this district operates in the river, the anti-debris laws of the State preventing. A location is selected within the tract, and upon this ground the hull of the dredger is built. When ready to launch, a small basin is excavated and filled with water from a local irrigating ditch. Into this miniature lake, of dimensions just great enough to float the dredger, it is launched, and operations begun. It there remains until the ground available is washed over. A dredger of the greatest size exhausts about twelve superficial acres of gold-bearing ground a year.

The monthly profit of the larger dredgers, though not publicly reported, is believed to be in excess of $12,000. Values from the borings referred to are sometimes less than 60 cents; the highest ever known was $2.71.

Jerusalem is supplied with water from King Solomon's "Sealed Fountain," seven miles south of the city. The water is conveyed partly through modern iron pipes, but partly by the old aqueduct known as Solomon's Aqueduct.

Patent Department

THE NEW COVER DESIGN FOR UNITED STATES LETTERS PATENT.

The United States letters patent for inventions, granted on October 28, 1902, appeared in a new dress. The terms of the grant have not been changed, but the cover on which the grant is engrossed, bears embellishments of new design. To those who are familiar with the appearance of the old patents, the accompanying fac-simile illustration will therefore be of no little interest. The new design presents a curious optical illusion. At first sight it appears as if the new cover were smaller than the old, although both are exactly the same size. The illusion is doubtless created by the ornamental border.

COL. J. J. ASTOR DEDICATES HIS MARINE TURBINE PATENTS TO THE PUBLIC.

To the Editor of the SCIENTIFIC AMERICAN:

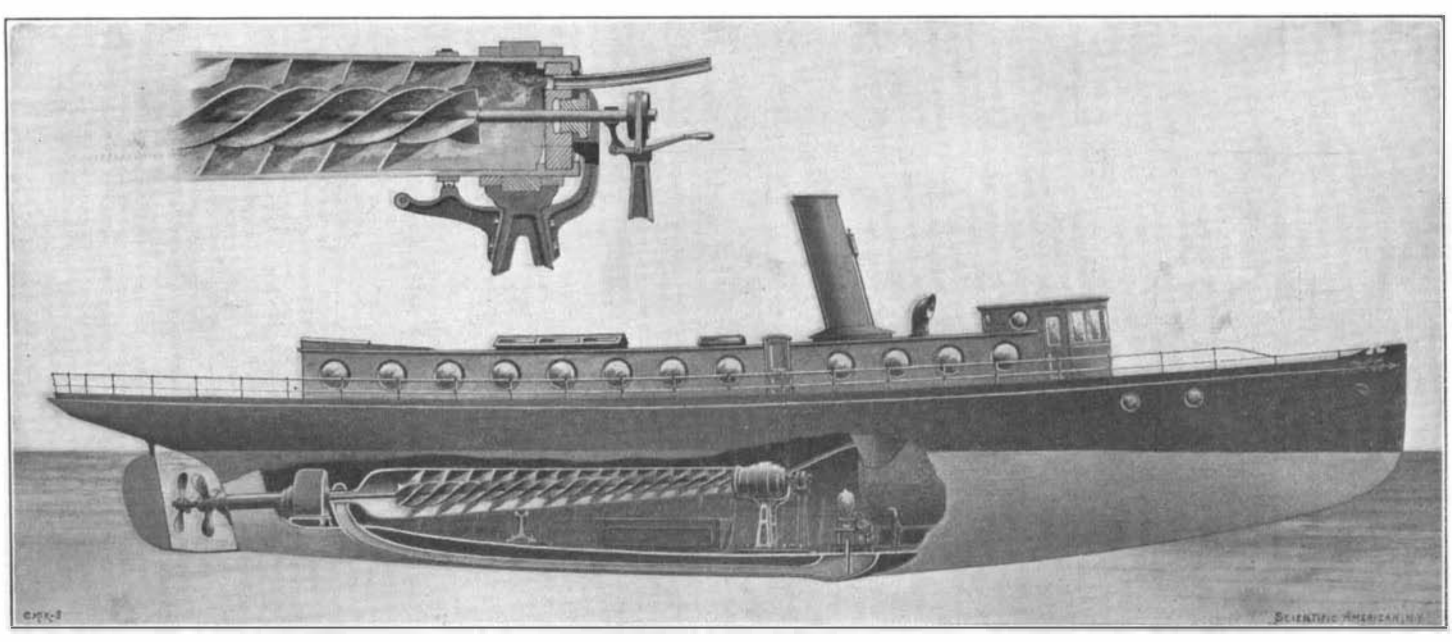
All my patents on marine turbines having been granted, I hereby dedicate them to the public, in the hope that the development of the ideal turbine may be hastened thereby.

The turbine is shaped like a funnel, and comprises an outer shell or drum and an inner shaft running axially through it, these parts being relatively rotatable and each having oppositely set spiral blades. The steam is admitted into the outer shell at the small end and passes through the turbine, expanding into the large end of the shell and acting on the spiral blades to rotate the shell and shaft simultaneously and in opposite directions. By allowing both the inner turbine and the outer case to revolve, the speed necessary to insure efficiency, which in ordinary turbines is often inconveniently high, is cut in half. As a result of this construction the weight is reduced practically fifty per cent.

By passing the inner solid shaft through the outer hollow shaft or drum, the structural advantage of running both through the sternpost of the ship is obtained, this being the strongest part. Moreover, the shafts are incased and protected for almost their entire length without changing the shape of the hull. Retaining all the advantages of twin screws, the propellers are little exposed to danger in docking as in a ship with a single screw.

Since both propellers revolve on the same axis, in opposite directions, but little power is wasted in imparting a rotary motion to the water, for after the passage of the ship the water is left entirely dead except for the necessary reaction resulting from driving the ship ahead.

To sum up, the following appear to me the principal advantages: 1, reduced weight; 2, higher steam efficiency; 3, higher mechanical efficiency, by reason of the reduced size enabling the parts to be fitted more perfectly, permitting the diminution of friction and also the reduction of the leakage loss; 4, such a turbine would seem to be particularly suitable in central station work for generating electricity, in which case the field and armature may be driven in opposite directions. This would improve the efficiency of the dynamo and increase its output for a given weight. This principle is obviously also applicable to gas engines.



COL. J. J. ASTOR DEDICATES HIS MARINE TURBINE PATENTS TO THE PUBLIC.

Further particulars and details concerning pumps, condenser, etc., may be obtained from the Patent Office at Washington by ordering a copy of patent No. 690,821, granted to me on marine turbines, or from the office of the SCIENTIFIC AMERICAN, 361 Broadway, N. Y. city, through which agency I obtained my patents.

The French patent is dated September 28, 1901; the English patent, October 1, 1901.

New York, November 1, 1902. J. J. ASTOR.