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LANDS BELOW THE OCEAN LEVEL.

In an article treating on some remarkable results of evaporation and rainfall, published on page 257 of our issue of April 28, this year, we described one of the instances of the great excesses of evaporation over rainfall, namely, the Caspian Sea, in which the surface is as much below the ocean level as our Lake Champlain is above the same, namely, more than 80 feet. There are, however, two still more remarkable cases of the same sort, the Dead Sea in Palestine and the Great Desert or Sahara in Africa. The former is remarkable for the great amount of the depression, and the latter for the immense surface depressed, being in fact the bottom of an extensive inland lake, totally dried up by the heat of a tropical climate, aided by the absence of feeding streams, and by the rainless area which covers its greatest portion. It is, on an average, 80 feet below the ocean, about as much as the Caspian Sea; but it is remarkable for its extent, being nearly 2,000 miles square, or nearly 4,000,000 square miles.

The French government, having an eye to the colonization of Northern Africa, with Algiers as a starting point, has for some time favored a project for restoring this sandy waste to its primeval condition by cutting a communication with the ocean, and so transforming it into a salt water inland lake. The effect of this on the climate of the surrounding country, and especially on the colony of Algiers, would undoubtedly be most beneficial, because the south wind, instead of blowing, as it does now, over a sandy desert, would become a sea breeze; this would increase the rainfall, and change a rainless district into a fruitful region. In a commercial point of view, moreover, the benefits of such a change could not be overestimated. The introduction of water transportation is especially advisable in this tropical region, where the miserable and utterly inefficient caravan is now the only mode of carrying goods; and without doubt commercial cities would soon spring up around the shores of the proposed inland sea, which would become the scene of a mighty travel and traffic, as the lake would give easy access to the surrounding countries, and develop this part of Africa to an extent thus far utterly undreamed of.

But it is well to look also at the disadvantages of this gigantic scheme. In the first place, it will rob the ocean of such an enormous amount of water that its general surface will be lowered to an appreciable extent. In order to realize how much this lowering will amount to, let us consider that the total terrestrial surface is, in round numbers, 200,000,000 square miles, of which the ocean occupies three quarters, or 150,000,000. If the estimate given of the Desert of Sahara, 4,000,000 square miles, is correct, it occupies $\frac{1}{38}$ part of the ocean's surface, and, therefore, every foot of depth of water abstracted for the Desert will diminish the ocean $\frac{1}{38}$ part of a foot; and the withdrawal of water for a lake 80 feet deep would leave the ocean level $80 \times \frac{1}{38}$, or more than two feet lower, which would be plainly perceptible in the many harbors where careful tidal observations are made, and in some cases changes may influence the shipping, robbing as it would do all parts of the world of over two feet depth of water, which would be very bad in those localities where the harbors are shallow.

This much as to an immediate result; but the ultimate consequences would be much more serious. It should be considered that this large inland lake, if once established, would have no fresh water supply, by rivers; but the sea water would certainly rush in through the channel, to make up for the large evaporation, which we may safely set down at 1,200 lbs. of water per year for every square foot. This would lower the level 20 feet per year, which is one quarter of the whole quantity of the lake. This, for a surface of 4,000,000 square miles, or 100,000,000,000,000 square feet, gives 2,000,000,000,000,000 cubic feet of water to be replaced annually from the ocean, or nearly 6,000,000,000,000 cubic feet per day, or 250,000,000,000 cubic feet per hour, or 4,166,666,666 cubic feet per minute, or 69,444,444 cubic feet or 525,000,000 gallons per second. As the German Rhine carries only 1,000,000 gallons of water per second, on an average, the channel bringing the supply to the Desert of Sahara from the ocean would have to carry as much water as is carried by 525 rivers like the Rhine; and from the salt water only pure water would be evaporated, leaving the salt behind. As this amounts to 4 per cent, or $\frac{1}{25}$ of the sea water, and as nearly 20 feet deep, or $\frac{1}{4}$ of the water in this new lake, would annually evaporate, it would only take 4×25, or 100 years, one single century, for all the water to disappear, and a deposit of salt take its place. Then the now sandy desert would be changed into a desert of salt: which salt would fill the whole basin, and would certainly be a more serious affliction to Algeria than the present sand plain can possibly be.

THE THORNEYCROFT FAST LAUNCHES.

In a recent description of the French torpedo experiments at Cherbourg, we noted the wonderful speed of nearly 19 knots per hour attained by a steel torpedo launch built by Messrs. Thorneycroft. In such small craft, displacing at most but about 15 tons, this extreme velocity appears to be obtainable only over short periods; but a speed of 18 knots has been maintained over measured distances for more than two consecutive hours, the engine then developing 220 horse power. The dimensions of a launch which attained this speed are as follows: Length 68·04 feet, beam 8·53 feet, draught of water (average) 2 feet, displacement (that is to say, the total weight of the vessel and all its contents) 15 tons.

While there can be no question but that these vessels demonstrate remarkable progress in navigation, on the other hand this achievement cannot be attributed to any new discovery, but results from improved application of known principles, and especially from the rare perfection of the construction of the motive apparatus, which develops great power, while its weight is reduced to the narrowest limits. This, however, it not the only element of success. The model of the hull is such as to diminish to the utmost the liquid resistance opposed to its onward movement. Again, the material of which the hull is built is such as not to absorb by its weight a fraction of the total displacement which may be usefully devoted to the motive machinery. To this end it is built of steel plates, and weighs but 9,900 lbs., or less than a third of the total displacement. In order that the propeller should afford the maximum effect, it is necessary that the liquid vein upon which it acts should be as large as possible in comparison with the resistant section of the vessel. Ordinarily the section of vein acted upon is less than the latter. In the Thorneycroft launch, the screw shaft is placed on a level with the keel, instead of being located at a point half way between the keel and the water line, as is usually the case. The screw then projects below the keel for nearly half its diameter, and consequently it acts upon a section of vein greater in area than the greatest section of the vessel. This arrangement doubtless contributes materially to the speed; while a sharp bend of the keel protects the propeller from damage.

As already noted, Messrs. Thorneycroft's success in producing a motor both light and powerful has been remarkable. The complete machine—that is, including boilers and the water contained—weighs in all 16,060 lbs. The power at the speed of $18\frac{3}{4}$ knots having been 220 horse, the weight is therefore but 72·6 lbs. per horse power. The machinery is therefore probably the lightest ever produced for purposes of navigation. Large marine engines for a long time rarely weighed less than 440 lbs. per horse power; and it is only through recent improvements that this has been reduced to 330 lbs. For ordinary launches, with non-condensing engines running at high velocities, the usual weight per horse power is about 220 lbs. It is therefore interesting to note under what conditions Messrs. Thorneycroft's engines are produced. They are condensing machines, two cylinder, on the compound system. The boilers are of the locomotive type, with the difference that the tubular surface is reduced about one half. This is the only sacrifice which has been made for the economic production of power; and it was necessary in order to reduce the weight of the apparatus. The safety valves are loaded to 13·2 lbs. The engine makes 430 revolutions per minute, which requires great mechanical excellence of the mechanism, and especially of the air pump. The consumption of coal per horse power per hour is 3·52 lbs. The grate surface is 11·19 square feet. An artificial blast is conducted directly to the fire chamber instead of to the ashpit.

THE PERMANENT SUPPLY WATER WORKS OF BALTIMORE.

One of the greatest engineering works now in progress is that to supply the city of Baltimore with water, and the gentlemen in charge of it have been so busy pushing it forward that they have had very little time to talk about it: in consequence of which not many people outside of the city know anything of it, and comparatively few have any idea of the immensity and difficulty of the works that are now so quietly progressing to supply them with an almost unlimited supply of the necessary article of water. One of our correspondents lately called on Mr. Robert K. Martin, the engineer in charge, who was so obliging as to show him over the line of works, and we are thus enabled to lay the following particulars before our readers.

Baltimore is at present supplied with works having a capacity of about 15,000,000 gallons a day, which comes from Jones' Falls to Lake Roland, whence it is brought by a conduit $3\frac{1}{2}$ miles long to Hampden reservoir and Druid Lake. From the latter, which is 53 acres in extent and 217 feet above tide, one portion of the water is raised by powerful steam pumps to a high service reservoir 350 feet above tide, for supplying the highest region of the city; a second part is supplied direct to the mains; and still another portion is allowed to pass to Mount Royal reservoir, which is only 150 feet above tide, so as not to give too high a pressure to the lowest portion of the city.

This supply having been found to be insufficient in the summer season, it was resolved to increase it temporarily by erecting, near the Gunpowder River, a pair of Worthington's duplex compound pumping engines, capable of raising 10,000,000 gallons a day from that river, over a hill 265 feet high, to Roland Run, a tributary of Jones' Falls above mentioned. This arrangement, however, was not sufficient for some of the more enterprising of the Baltimoreans, and a new plan was devised; and it is now being carried out, notwithstanding considerable opposition by interested parties, by the capable and energetic civil engineer of the Water Commission, Mr. R. K. Martin, who had charge of the previous works, erected in 1858. The source of the new supply is the Gunpowder River, which at about nine miles from Baltimore makes its nearest approach to the city, as at this point it takes a bend in another direction Advantage is taken of this turn to form a dam across the stream, and so form a storage lake which will, it is believed, be capable of supplying the city with 175,000,000 gallons of water every twenty-four hours. This lake will be from 500 to 1,000 feet wide, about 20 feet deep on the average, and will extend up