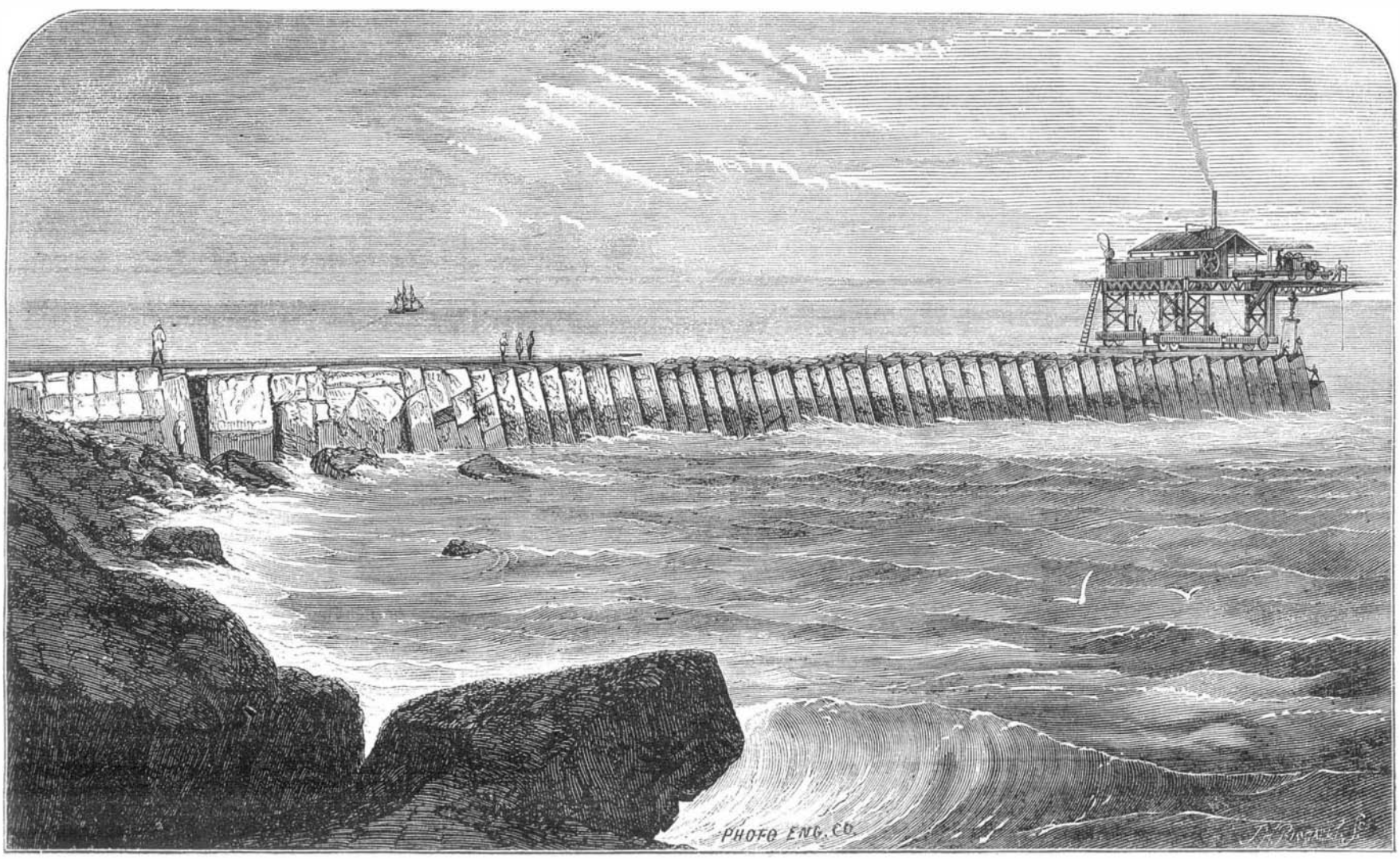
THE MANORA BREAKWATER.

From previous accounts of works now being carried out under Mr. W. Parkes for the improvement of Kurrachee harbor, in Scinde, India, it will be remembered that a breakwater from Manora Point forms one of the most important features of the undertaking, its object being to protect the entrance of the channel leading into the harbor. The breakwater is not yet sufficiently advanced to have produced the full beneficial results to be expected from it, but its stability as a structure has thus far been already fairly tested. The general principle of the breakwater is that of a bank of rubble stone laid upon the natural bottom and brought up to a level of 15 feet below low water, but near the shore, where the original depth is less than this, to ten feet below low water. Upon this bank of rubble stone, a superstructure is raised, consisting of blocks of concrete each, 12ft. × 8ft. × 4½ ft. and weighing 27 tuns, set upon the narrowest side so that the whole superstructure consists of two blocks in width and three in hight, forming a solid wall, with vertical sides 24 feet wide and 24 feet high. The blocks are set in place by means of an overhanging crane.—*Engineering.*



THE MANORA BREAKWATER, KURRACHEE HARBOR, INDIA.

Old Rags.

First and foremost of the many applications of this humble material is the manufacture of paper; for this purpose England alone uses not less than 85,000 tuns of rags and waste, representing a money value of about $3,500,000. The transformation effected by the action of certain chemicals on paper is very striking. A sheet of common white blotting paper, which will scarcely bear its own weight when wetted, is converted in a few seconds, by the action of sulphuric acid, into a substance possessing all the properties of ordinary animal parchment, and so strong that it can be only broken with difficulty. Great as this change is, strange to say no chemical alteration has really taken place; the acid merely produces a molecular change, and is entirely washed away at the end of the process. Rags from woolen materials undergo many peculiar metamorphoses; old clo' criers first collect them; they are then successively converted into mungo, shoddy, and devil's dust, and reappear as ladies' superfine cloth; they then degenerate into druggets, and are finally used for the manufacture of flock paper. After undergoing all these transformations, they are used by the agriculturist as manure, on account of the large amount of nitrogen they contain. The presence of this element makes them of great use, also, to the chemical manufacturer; he boils them down with pearlash, horns and hoofs of cattle, old iron hoops, blood, clippings of leather, and broken horseshoes, and produces the beautiful yellow and red salts known as prussiates of potash. From these, again, the rich and valuable pigment called Prussian blue is made, and thus do our old rags enter upon a fresh career of beauty and usefulness, to form, in their turn, other waste products, which may again be utilized through the power of man's intelligence.

Bones and their Products.

Bones are composed of half their weight of phosphate of lime, about a third of their weight of cartilage or gelatin, and the remainder of earthy matters. The gelatin is extracted by boiling water under pressure, and is used to stiffen calico, etc.; when purified, it constitutes the nutritious aliment known as calf's foot jelly.

When the bones are heated without access of air, the organic matter of the cartilage is decomposed, oily products passing over, and a black, carbonaceous residue being left; this is bone black, or animal charcoal, greatly used as a deodorizer and disinfectant. Bones, when calcined and heated with sulphuric acid, yield superphosphate of lime, so highly esteemed as a manure. The last, and certainly the most important, application of bones is the manufacture of phosphorus. The bones are first burnt, to remove all traces of animal matter; the resulting bone earth, as it is called, is then subjected to the action of sulphuric acid, by which superphosphate of lime is produced. This acid phosphate is then mixed with charcoal and strongly heated in a retort, when it splits up into normal phosphate and phosphoric acid, the latter being finally reduced by the charcoal to phosphorus, while hydrogen and carbonic oxide are liberated as gases. The combustible and poisonous properties of phosphorus make it very dangerous to employ in the arts; but Professor Schröter discovered that when ordinary phosphorus was heated for some time in a closed vessel to a temperature of 470°, it lost its power of igniting spontaneously, and became of a deep red color. By making use of this discovery, matches can now be made without danger, either to those who manufacture them or to those who use them. The safety match is made by putting the oxidizing material alone on the match, the red phosphorus being mixed with emery and pasted on the side of the box.

The Luminiferous Ether.

Though compelled to think of space as unbounded, there is no mental necessity to compel us to think of it either as filled or as empty; whether it is filled or empty must be decided by experiment and observation. That it is not entirely void, the starry heavens declare, but the question still remains: Are the stars themselves hung in vacuo? Are the vast regions which surround them, and across which their light is propagated, absolutely empty? A century ago the answer to this question would be: "No, for particles of light are incessantly shot through space." The reply of modern science is also negative, but on a somewhat different ground. In support of the conclusion that the celestial spaces are occupied by matter, it is able to offer proofs almost as cogent as those which can be adduced for the existence of an atmosphere round the earth.

The notion of this medium must not be considered as a vague or fanciful conception on the part of scientific men. Of its reality, most of them are as convinced as they are of the existence of the sun and moon. The luminiferous ether has definite mechanical properties. It is almost infinitely more attenuated than any known gas, but its properties are those of a solid rather than of a gas. It resembles jelly rather than air. A body thus constituted may have its boundaries; but, although the ether may not be co-extensive with space, we at all events know that it extends as far as the most distant visible stars. In fact it is the vehicle of their light, and without it they could not be seen. This all pervading substance takes up their molecular tremors, and conveys them with inconceivable rapidity to our organs of vision. It is the transported shiver of bodies countless millions of miles distant which translates itself in human consciousness into the splendor of the firmament at night.

If the ether have a boundary, masses of ponderable matter might be conceived to exist beyond it, but they could emit no light. Beyond the ether dark suns might burn; there, under proper conditions, combustion might be carried on; fuel might consume unseen, and metals be heated to fusion in invisible fires. A body, moreover, once heated there, would continue for ever heated; a sun or planet once molten, would continue forever molten. For, the loss of heat being simply the abstraction of molecular motion by the ether, where this medium is absent no cooling could occur. A sentient being, on approaching a heated body in this region, would be conscious of no augmentation of temperature. The gradations of warmth dependent on the laws of radiation would not exist, and actual contact would first reveal the heat of an extra ethereal sun.—*Tyndall.*

Economical Steam Power.

The trial trip of the new screw steamer, *Torino*, built by Messrs. Oswald & Co., of Pallion shipyard, Sunderland, has lately taken place. The steamer is for the Italian Lloyd's Company, and of the following dimensions: Length between perpendiculars, 270 feet; breadth, 33 feet; depth of hold, 21 feet; register tunnage, 1,553 tuns. She has a draft of water forward of 7 feet 10 inches; aft, 11 feet 2 inches. The vessel is fitted with all modern appliances for increasing the comfort of passengers and the capacity for cargo, and is specially designed to attain a high speed under steam with a small expenditure of power. Her engines, which have been made by the builders of the vessel, are of 160 horse power nominal, of the inverted cylinder, compound, surface condensing type, the cylinders being 34 inches and 64 inches in diameter respectively, with a stroke of 3 feet. It was found that under 1¾ lbs. of coal per horse power per hour was used, which small quantity may be traced to the introduction of Messrs. Oswald's feed heating apparatus, which increased the temperature of the feed water to 185°, the heat being extracted from the exhaust steam by injecting the feed water through it in a vessel connected with the exhaust pipe, thus utilizing a quantity of heat which would otherwise have been lost. There are two boilers on the cylindrical return tube principle, constructed for a working pressure of 65 lbs. per square inch. It was observed as a result of the trial that the mean speed was 10 9 miles per hour, which included the time lost for priming, etc. The average revolution of the engines showed 67; average steam, 62; vacuum, 26; indicated horse power, 753; temperature of feed water 185°, with patent feed heater. The trial was considered eminently satisfactory.

A HUMMING bird flew into a court room in Georgia during the session of the court one day recently, at 10½ A. M., and continued to fly within a few inches of the ceiling until six P. M., when it fell slowly and lighted on a mantelpiece, where it was captured. It was on the wing seven and a half hours without rest.