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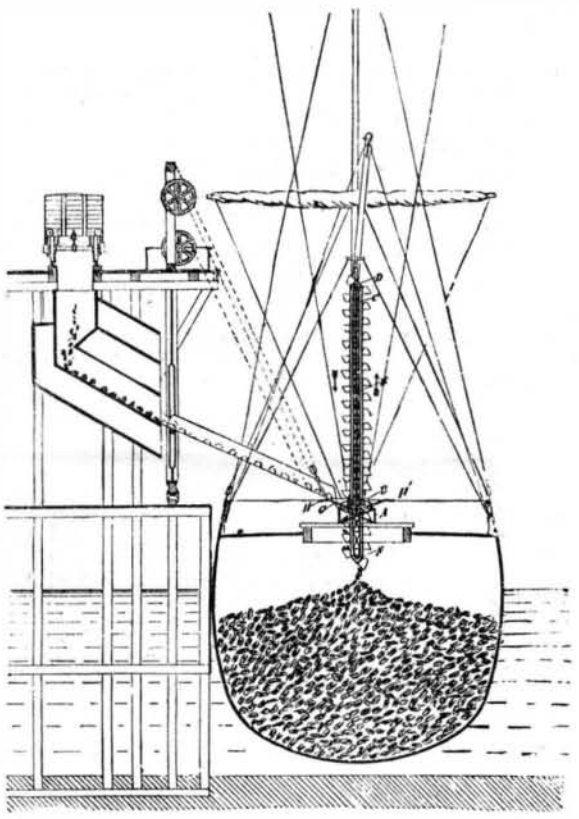
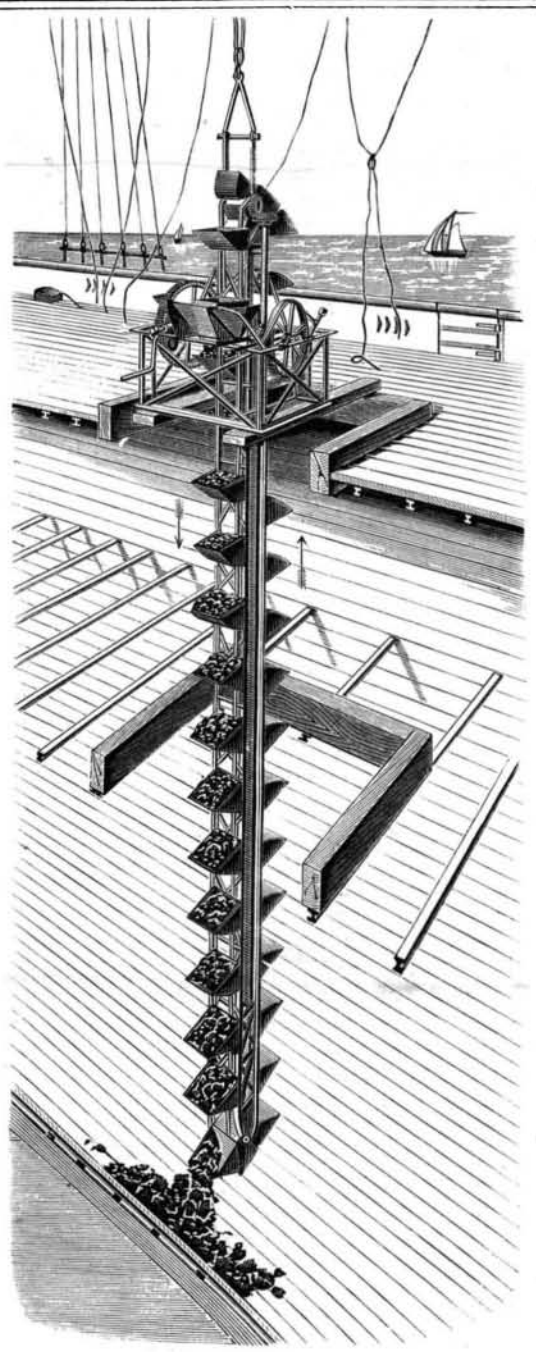
APPARATUS FOR COALING SHIPS.

In the ports of England the loading of ships with coal is generally effected in the following manner: The car coming from the mines is hauled to the upper part of a trestle-work, the bottom of the car is opened, the coal falls into a hopper, follows an inclined chute as far as the hatchway, and from there is thrown into the hold. This mode of loading is very rapid and very economical, the only disadvantage that it presents being that large coal, on falling into the hold from the end of the chute, breaks into small fragments. To obviate such a disadvantage, Mr. James Rigg has invented and constructed, in his works at Chester, an apparatus which is shown in three annexed figures, and which constitutes a system that can be employed not only for the loading of coal, but also for letting down to the bottom of the hold bricks, stones, salt, etc.

One of the figures gives a general view of the apparatus arranged in the interior of a ship's hull; and from the other





two figures may be seen how it operates when the loading begins and the hull is still empty, and when, the hull being nearly filled, the operation is about ended. As may be easily seen from these cuts, the apparatus is exceedingly simple, consisting of an endless chain provided with buckets, and running around a vertical bucket frame. At the upper part there is a wooden frame, to which is fixed the head of the bucket frame, and which is laid across the hatchway. The weight alone of the materals is utilized to cause the working of the endless chain, without the necessity of having recourse to a motor. The bucket frame is raised or lowered according to needs, either by the aid of a pulley installed in the masting, or by means of a small windlass fixed upon the frame. The buckets, in their descent, pass in front of an open hopper, where they become filled, and empty themselves only at the moment at which they are revolving over the lower drum at the extremity of the bucket frame.

In order to regulate the descent and prevent its taking place too rapidly, a brake is fixed on the upper frame, and serves to actuate a vertical shaft that acts upon the axle of the upper drum by means of a cone wheel. The vertical shaft, which descends nearly to the base of the bucket frame, is provided with a groove throughout its entire length, in order that the action of the brake may occur, whatever be the position of the bucket frame. Mr. Rigg's apparatus is constructed almost wholly of steel, thus causing it to be very light, while having all the strength necessary.

It is very portable, and, in the different applications that have been made of it, its working has left nothing to be desired.

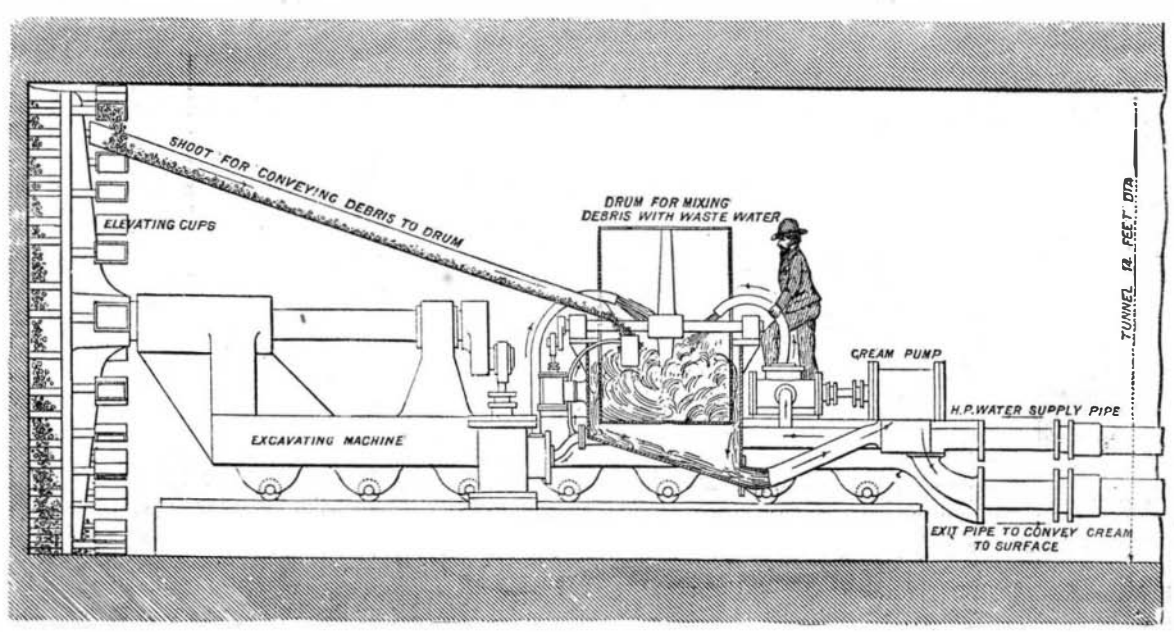
IMPROVED ELEVATORS FOR LOADING SHIPS WITH COAL BALLAST, ETC.

MACHINE FOR EXCAVATING THE CHANNEL TUNNEL.

An interesting lecture was lately delivered at the *conversazione* held at Leeds during the meeting of the Institution of Mechanical Engineers, by Mr. Crampton, in which he described his proposed method of executing the work of boring the Channel tunnel. We condense the following from the lecture:

The tunnel is assumed to be twenty miles long, independent of approaches on either side, to be excavated 36 feet in diameter in one operation, which, with an internal lining of 3 feet all round, will leave a clear tunnel 30 feet in diameter; and that the work will be commenced simultaneously at both ends. It follows, therefore, since the approaches may be made at the same time as the main tunnel, that we need only consider here a length of ten miles of excavation worked from one face.

Practical trials in chalk made with machines many years since, established the fact that a rate of advance may be easily maintained of one yard per hour, or twenty-four yards per day, at which rate the work of excavating ten miles of tunnel would take two and a half years to accomplish, taking the year at 300 working days. With the simple apparatus on the table, as much as five yards forward per hour has been cut 12 inches in diameter. The advance of one yard forward per hour in a 36 foot tunnel will necessitate the removal of 113 cubic yards of chalk per hour. In order to insure the due performance of the necessary work, I will add fifty per cent to the figures here given, and shall henceforth deal with other items in the same proportion. We have to provide, then, for the removal of 170 cubic yards of *débris* per hour, equal in weight to 250 tons, a greater quantity than is lifted in two of our greatest collieries together in the same time.



AUTOMATIC MACHINE FOR THE SUBMARINE TUNNEL BETWEEN FRANCE AND ENGLAND.

Near the mouth of the upright shaft powerful machinery will be erected to pump water from the sea, to press it up, and hold it under compression by means of force pumps and accumulators. The water will be compressed on the top to 512 pounds per square inch, the fall through 400 feet from the sea will add another 188 pounds per square inch, producing thus at the bottom of the shaft 700

(*Continued on page* 116.)

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