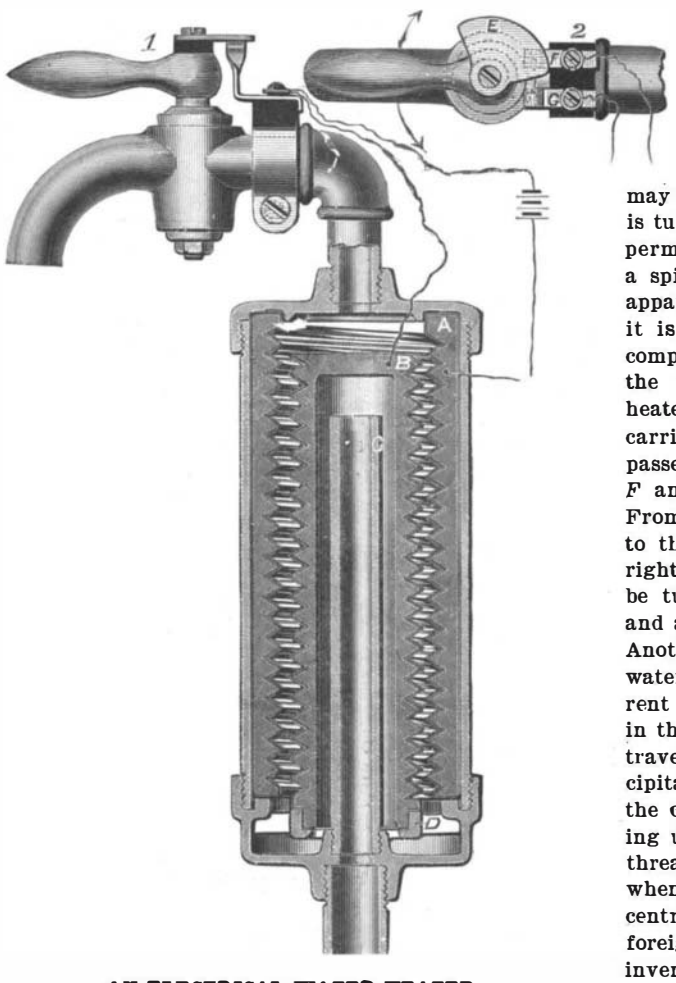
AN ELECTRICAL WATER-HEATER.

There are many occasions when the instantaneous heating of water is rendered necessary. It may be desirable to let the fire which heats the water in the boiler go out, as in summer or at night, and in many places electricity can be obtained where running water does not permit of a hot water system. The



AN ELECTRICAL WATER-HEATER.

device shown in our engraving obviates these difficulties wherever a current of electricity can be obtained.

The top of the device consists of a spigot, the manipulation of the handle of which in one direction sends a current of electricity through the heater so that hot water may be obtained, while by turning the handle in the opposite direction it will result in cold water issuing from the spigot. A core is secured to the supply pipe, which, of course, permits of a water pressure being maintained in the pipe at all times. The water passes up the pipe, *C*, through the surrounding channel and out through the ring-shaped orifice, *D*. The water then passes up the zigzag passages and out through the spigot. The core, *B*, is preferably made of carbon pressed into shape, this inner core and its inclosing cylinder forming electrodes of an electric current. The periphery of the core, *B*, is provided with spiral grooves in the shape of screw threads.

The faces of the threads are covered by some suitable fabric which is pressed into shape when the core is being formed. The wire or cord is wound around in the bottom of the grooves to hold the cloth or fabric in its desired position. The object of incasing the carbon core or electrode with cloth or fabric is to prevent the disintegrated carbon passing out through the spigot with the running water, in addition to which the presence of the fabric enables the core to be molded much easier and it will hold its shape better than where the sharp corners of the green carbon are exposed. Surrounding this core is a cylinder which is threaded into the base casting, and whose top is closed by a cap. This cylinder carries the encircling electrode, *A*, which is insulated from its support, as is also the core, *B*. The electrode is formed with spiral grooves in its inner face, corresponding with the thread of the core, so that the water must necessarily follow the zigzag path. The inner face of the electrode is covered with fabric for the same reasons as have already been given. The core terminates short of the cap-piece, forming a chamber in the upper part of the heater from which leads the discharge pipe, which in turn runs to the spigot, which may be of the usual style, or may be constructed so that when the operating handle is turned in either direction the spigot will be open to permit the passage of the water. With the aid of such a spigot it is possible to run cold water through the apparatus when it is turned in one direction, and when it is turned in the opposite direction the circuit is completed and the electrodes are energized so that the water passing through the apparatus will be heated before it issues from the spigot. The handle carries a contact making and breaking plate, *E*, which passes over the face of the two terminal contact points, *F* and *G*, which are secured to an insulation block. From these terminals wires lead to the core and to the electrode. When the handle is turned to the right the water will not be heated, but if the handle be turned to the left the circuit will be completed, and all the water which passes through will be warm. Another interesting feature is the fact that the hot water, at least, will be sterilized, for a 110-volt current will destroy all the animal and vegetable matter in the water, the zigzag path which it is compelled to travel being advantageous; and it also tends to precipitate any foreign matter in the grooves without the core or the encircling electrode. The water passing upwardly through the zigzag path formed by the threads will also be given a whirling motion, so that when it reaches the chamber in the top of the heater centrifugal action will assist in ridding the water of foreign particles. This very interesting and useful invention was recently patented by H. M. Hill.

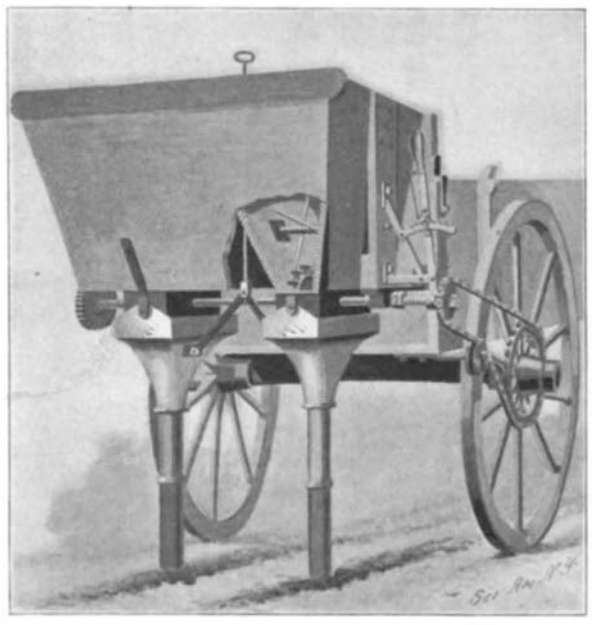
AN IMPROVED FERTILIZER-DISTRIBUTER.

A fertilizer-distributer which can be fitted to an ordinary wagon, and which is of such construction that it can deliver material within a wide range, is the subject of an invention patented by Harris McVea, of Vanceville, La.

The frame of the distributer consists of a backboard and a downwardly and inwardly inclined front section. When the device is to be used, the tail-board of the wagon is taken out and the backboard of the distributer substituted.

Within the frame two hoppers are located, through both of which an agitator-shaft passes, serving to break up the lumps in the material. Beneath the agitator-shaft a feed-wheel shaft is mounted, the feed-wheels being arranged so that they turn in the discharge openings of the hoppers. This feed-wheel shaft is driven from one of the rear supporting-wheels of the wagon by a sprocket-and-chain gear, a lever-operated clutch mechanism being provided to throw the feed-wheel shaft into and out of gear with the supporting-wheel of the wagon. Slides are provided for closing the discharge-openings of the hoppers.

The fertilizer, fed by the wheels, passes through two spouts to the ground, which spouts are pivotally mounted and are swung to or from the ground by means of two links pivoted to the spouts and operated by a vertical handle-bar provided with means whereby it can be held in any adjusted position. By thus pivotally mounting the spouts and adjusting them for any width between rows, the fertilizer can be delivered within a wide range. The fertilizer is to be carried in the wagon and supplied to the hoppers in any desired manner.



AN IMPROVED FERTILIZER DISTRIBUTER.

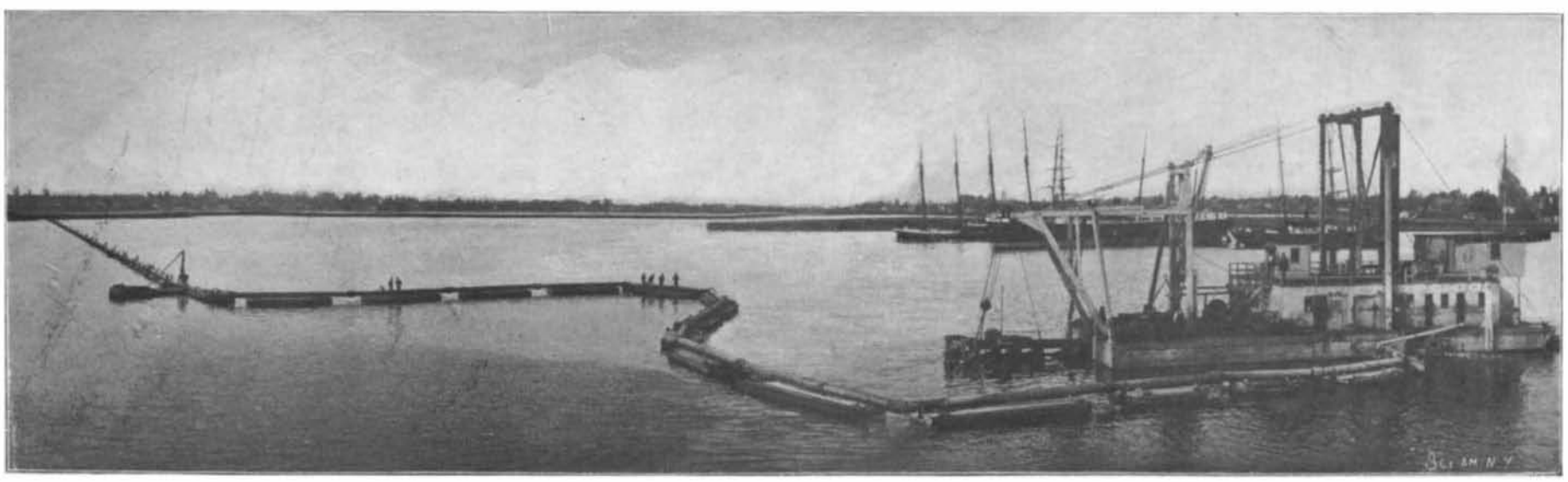
HARBOR IMPROVEMENT, OAKLAND, CAL.

The improvement of Oakland Cal., Harbor is one of the greatest undertakings of the general government on the Pacific Coast. In 1874 a shallow estuary flowed through a vast extent of marsh land, mostly covered at high water. A recent report of the commerce of the estuary, after the 20-foot channel had been dredged, indicated that freight to the amount of 3,254,215 tons and passengers to the number of 186,360 had been transported in 1899.

The purpose of the improvement is to extend deep water navigation to the two prosperous cities, Oakland and Alameda, which have a joint population of 100,000. The new harbor lies between these communities, both of which have extensive manufactories, which find splendid sites on land which has been raised above tide by material dredged from the channel. There are also admirable facilities for the economical shipment of freight. Shipbuilding, lumber yards, iron works, the handling of coal and other heavy products, are concentrated on the banks of the new channel. The added value of the reclaimed ground amounts to many times the cost of the improvement, which up to date is $2,450,000. The first appropriation for the improvement was made in 1874, and amounted to $20,000. The scheme is now but partially complete. Two stone jetties start from the deep waters of San Francisco Bay and extend, the north one 13,000 feet, and the south jetty 10,000 feet, in parallel lines, 800 feet apart. The jetties, or training walls, are composed of stone, and between these walls a channel 20 feet in depth and 300 feet in width, has been dredged. The total length of the harbor is 19,000 feet, and at the easterly terminus a tidal basin 300 acres in extent has been deepened, so as to afford a safe harbor for accommodation of ships out of commission or laid up for the winter.

From the channel alone 647,715 cubic yards were raised by dredging, and deposited on the shores. Several thousand acres have been thus reclaimed. The first scope of the Oakland Harbor improvement was greatly below present realizations. The jetties have been raised several feet, and a strong movement has been inaugurated to increase the channel to a width of 500 feet at the present depth and to extend its length to double its present dimensions.

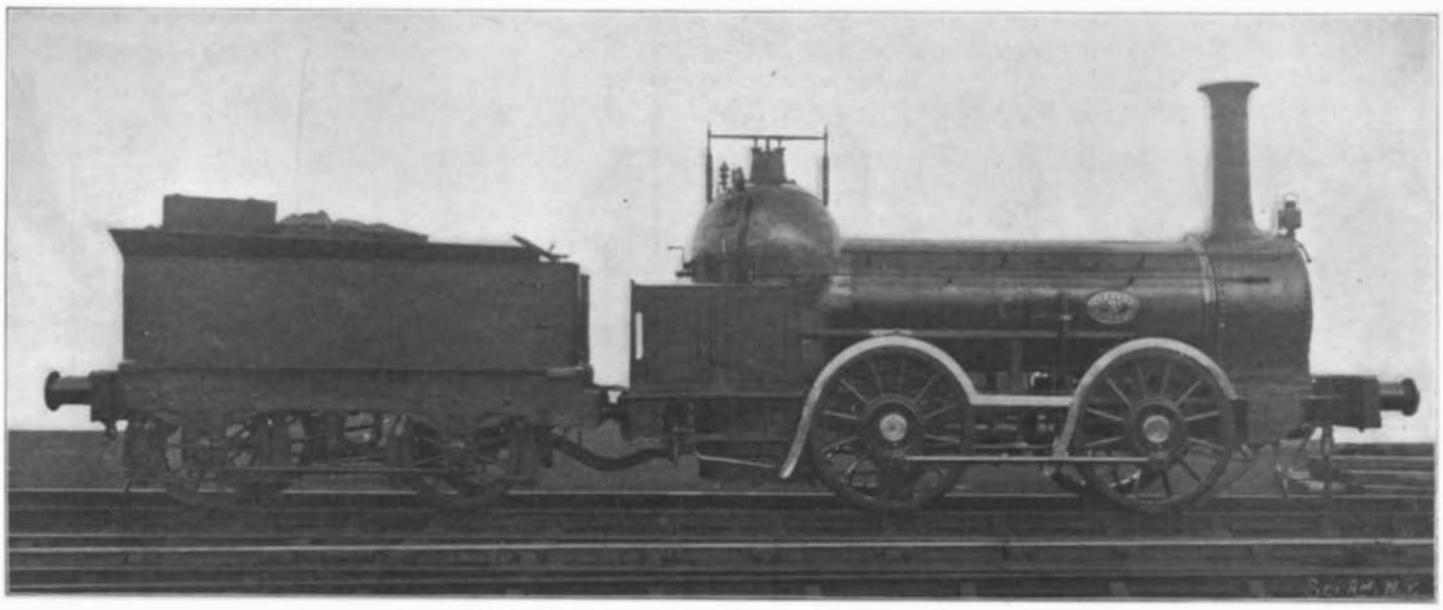
The material through which the channel was dredged consists of mud, sand, and a hardpan. Be-



HARBOR IMPROVEMENT, OAKLAND, CAL.

tween the jetties deposits of hardpan were met with; but the rotary cutter of the hydraulic dredger found no particular difficulty in breaking into this material. The hydraulic dredger used in late years measures 120 by 40 feet, with engines of 400 horse power and with a suction and discharge pipe 20 inches in diameter. Depending upon the character of material, its capacity ranges from 1,000 to 5,000 cubic yards per day.

On the east side of San Francisco Bay the shallows extend from the shore line fully two miles. Upon this flat the currents from the rivers discharging into the bay are driven by prevailing westerly winds. In time of flood, these river waters are full of sediment, which is deposited when the comparatively calm areas of the lower bay are reached. The ferry landings on the east shore are of great length. The Oakland pier is fully two miles in length, and the one at Alameda nearly twice as long. Both are of pile work, which suffers terribly from the destructive ravages of the teredo. Gradual progress has been made in filling in the trestles, especially on the Alameda pier, which runs directly on one side of the new channel. The material for filling is obtained by dredging from the estuary and utilized for making a solid roadbed for the railroad tracks. A space 9,000 feet long and 150 wide to a depth of 10 feet was recently filled in this way. A bulkhead was built on each side of the track, and into this space a pipe 20 inches in diameter, extending from the dredger, 5,700 feet distant, and supported by pontoons and piles, discharged a continuous stream of gravel and water, until the present solid roadbed of solid material was formed. The Oakland Harbor improvement has proved of even greater value than anticipated. The works are in charge of Col. H. E. Heuer, of the U. S. Corps of Engineers.



EARLY ENGLISH LOCOMOTIVE; IN SERVICE 1846 TO 1901.

CURIOUS LOCOMOTIVE EXPLOSION.

The accompanying illustrations are reproduced from photographs of an unusual railroad wreck which occurred to a local passenger train on the Denver & Rio Grande Railway, between La Veta and Cuchara, Colo. The disaster was due to the rupture of the boiler at the junction of the barrel and the firebox. The train consisted of a locomotive, ten freight cars, and a passenger coach at the rear, in which were some twenty-five passengers. The explosion occurred when the train was about one mile distant from La Veta station. The engineer and the fireman were instantly killed, and the concussion was so violent that buildings a mile distant from the track were severely shaken, and the noise of the explosion was heard at points twenty miles away, where it was supposed that an exceptionally heavy mining blast had been set off. The body of the engineer was found between 500 and 600 feet distant from the track and mutilated beyond recognition. The engine, as will be seen from the illustration, was completely wrecked. The upper sheet of the firebox was torn entirely loose from the boiler, and thrown a distance of over 600 feet to the right, landing on ground which was about 50 feet above the level of the track. The force of the explosion was sufficient to strip the boiler entirely from its seating, and the barrel was driven forward with a rocket-like action along the ground, plowing a deep furrow at the left of the track for a distance of 125 feet. The blast was also sufficient to tear the body of the tender loose from its frame and throw it around at right angles to the track, as shown in the accompanying illustration. The first car behind the tender was overturned and landed bottom up, to the left of the track, while the second and third cars were thrown over to the right. One of our illustrations shows the point at which rupture took place in the boiler. It will be seen that the firebox is entirely gone and the tube-sheet and tubes are exposed, showing the staybolts either ruptured or pulled out. Several staybolts, we are informed by our correspondent, were found to be eaten through and others almost through by the action of the alkali in the water.

The Wrecked Boiler.

View from Front of Train.

LOCOMOTIVE EXPLOSION AT LA VETA, COLORADO.

A LOCOMOTIVE CURIOSITY.

There has just been withdrawn from service in England one of the oldest locomotives in existence. Up to a few weeks ago this engine, which was constructed in 1846, was regularly employed for hauling mineral traffic upon the Barrow-in-Furness Railroad, which was one of the first railroads in England, having been opened for traffic for considerably more than half a century. The total length of this railroad is only 170½ miles, yet it is one of the most profitable lines in the United Kingdom, a fact due to a large extent to the heavy mineral traffic that it carries.

This engine, officially known as "Number 3," but familiarly styled "Old Coppernob," from its curious firebox, which is built of copper and is dome-shaped, is the survivor of three similar engines that were built in the early '40's for this railroad, though the two previous engines were somewhat smaller. The cylinders are 14 inches in diameter, with a 24-inch stroke. The steam pressure was 120 pounds per square inch. The heating surface of the tubes is 805 square feet, and of the firebox 49 square feet. The total weight of the engine and tender in working order was 32 tons 8 hundredweight. The wheels are four coupled, 4 feet 9 inches in diameter on the tread, and the engine frames are of the frame type with upper and lower members. The axle boxes are made of gun-metal and the motion is of the curved link type. The boiler is 11 feet 2 inches long and 3 feet 6 inches in diameter. The boiler plates are made of Low Moor iron throughout with the exception of the firebox, the barrel being made up of three rings.

A curious feature of the tender of the engine is that the under frame is constructed entirely of oak. The tender has a water capacity of 1,000 gallons. Although this old locomotive has been regularly running for over 53 years, when withdrawn from service it was found to be thoroughly strong and perfect in every respect. The working parts were in first-class condition. Although old-fashioned in design and pattern, it was a very serviceable engine, and an idea of the serviceableness of this type of locomotive may be gathered from the fact that the same company has several other similar "copper-nobs," though of a more recent date, still running upon its system.

Now that it has been withdrawn from active service the locomotive is to be placed in a well-merited place of honor. The railroad company are having a special glass-covered case erected in a prominent position at their Barrow terminus to accommodate the relic, and it will constitute an interesting memento of the early days of the railway era and also form a striking contrast with the fleeter and more powerful locomotives of to-day.

Use of Old Wooden Paving Blocks.

An ingenious use has been found for the discarded wood blocks with which the London streets are paved. The woods employed for this purpose are the karri and jarrah woods of Australia, which, owing to their density of grain and extreme hardness, are peculiarly adapted for paving purposes. This wood, owing to these characteristics, is familiarly styled "ironbark." Hitherto when a street was renewed the old wood blocks were sold at a low figure to the poorer classes, and in some instances were given away to those who cared to carry them away. They are, however, now being put to a new use. The wood blocks are in reality only surface damaged. The inside is as hard and as durable as it was when first laid down. Realizing this feature, several toy manufacturers throughout the country approached the authorities, and now purchase all those blocks which are not damaged in the process of being torn up, for the purpose of making the cheap toys out of them. The wood is bought at a low figure, and by means of special machinery that has been laid down the outside is trimmed off and the remaining portion converted into small toys. The wood, owing to its strong nature, is excellently suited for this purpose; and owing to the fact that the raw material is purchased so cheaply the home manufacturers are in a position to undersell consider-