OSTIA, THE PORT OF ANCIENT ROME.

The subject of the trade of Rome is an interesting and important one. The metropolis of the ancient world at one time numbered about 1,000,000 inhabitants, and it was no small task to provision this city. Ostia, on the coast

of the Mediterranean |Sea, now about twenty-one miles by rail from Rome, was naturally the great entrepôt. IIt was settled in the second century after the foundation of Rome, by Ancus Martius, and soon became an important commercial town. Under Augustus it lost some of its importance, due to the choking up of the harbor by the Tiber. Christianity was introduced at an early date, and the Bishopric of Ostia, according to some accounts, was founded by the Apostles themselves. The early Popes were all consecrated by the Bishop of Ostia.

The Tiber at present washes down eight and one-half million tons of sand annually, and this gradual extension of the delta has left Ostia miles inland. The as-

tronomer, Padre Secchi, and Prof. Lanciani have determined that the average yearly increase of the coast is about 19 feet.

The Tiber was a bad river to navigate, and while a man-of-war could easily get over the bar, owing to its light draught and great propelling power, merchantmen usually had to anchor outside and discharge their cargoes with the aid of lighters. The old Romans made no attempt to improve the harbor, which they

could have done very easily, for ves-; sels of 150 tons burden now reach Rome. In early times the vessels were towed up stream by oxen and buffaloes, tow-paths being provided for them. Navigation was not allowed at night. and the vessels had to moor at stations. Prof. Lanciani states that there were thirty of these stations be-

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a splendid appearance, as it contained fine temples, theaters, and villas of patricians, and the ruins were so extensive that for five centuries the villagers burned marble for lime without exhausting the supply; and when Poggio Bracciolini visited Ostia with Cosimo de' ground floors and basements being used for storage purposes. One of the rooms is in excellent preservation. It is 36 feet long by 28 feet wide, with six rows of large earthern oil jars 4 feet in diameter, each marked with its capacity. Another store belonging to the same house is



ENTRANCE TO WAREHOUSES IN OSTIA.

Medici they found the villagers occupied with burning an entire temple into lime. It is sad to contemplate the loss of so many antiquities, for the rude peasants burned wall facings and statues alike.

Our engraving represents the warehouses along the so called "Street of Wharfs." The floors are raised three feet above the pavement to facilitate the loading of carts. On the opposite side the ruins seem to belong to the private houses of merchants, the closely, one to the other. These little blocks are about 3 inches square and are arranged to run in diagonal lines; the angles of the wall have neatly worked quoins with the inner end pointed so as to work in with the small lozenges. The effect of this sort of facing is very neat, but its beauty seems to have been very largely concealed by stucco. The front walls of the warehouse were built of brick which average 1 foot 11 inches square. The voussoirs are also of brick and the pedi-

> admirably handled. The engraving is interesting as showing Ro man methods of construction, and also as showing how well the Romans built, even where the structures were used for such ordinary purposes as warehouses.

At the beginning of the empire, Rome had a population of [a million, and the necessity of

vaulted over and

has two circular

openings for light.

The barrack of

the firemen (vigi-

les) and consta-

bles is one of the important ruins

of Ostia. These

men were numer-

ous, as frays and

fires are very apt

to occur where

large bodies of

lawless sailors are

Our first en-

graving shows a portion of one of

the warehouses,

and it may also be

seen in the middle of the second en-

graving. It gives

an admirable idea of the solidity

with which the

Romans built all

constructions of this kind.

Through the arch to the left may

be seen the con-

crete which was faced with what

is known as "opus

recticulatum."

where the stones were carefully cut

so as to present a

square or lozenge-

shaped end, and

are fitted very

ment and en-

tablature are

congregated.



and the sea. Vessels from Ostia often reached Alexandria in eleven days and Gibraltar in five days. At Ostia the warehouses covered onehalf of the town, which was two miles long and one mile wide. The city of Ostia must have presented

tween Rome

building a better harbor than that of Ostia, which was rapidly filling up, be came evident. Claudius built a new harbor two miles up the coast of Ostia. It was inclosed by jetties; the area of the harbor was about 6,-200,000 square feet, and the quays were

over a mile long. The breakwater was constructed with the aid of caissons. The huge ship by which the Vatican obelisk was brought from Egypt was filled with concrete until it sank, then it was strengthened with rocks until it was above the level of the sea, when it was crowned by a lighthouse. The Emperor Trajan, in A. D. 103, founded Porto, as the harbor constructed by Claudius as a substitute for that of Ostia had soon shared the same fate. Trajan constructed a new canal, which now forms the main arm of the Tiber. Trajan's port is now two miles inland, and is a shallow lake surrounded by ruins. It resembled in every way a modern port; it was hexagonal in shape, and the basin communicated with the Port of Claudius. Trajan's harbor is one of the most interesting works of Imperial Rome.

Egypt alone shipped 190,000,000 bushels of grain to Rome, and Sicily, Sardinia, and other places poured in their enormous supplies of foodstuffs. In addition to this may be reckoned the vast quantities of building materials, especially marble, which were imported. The Claudian harbor was also used as a great naval station, and here was also the central post office for foreign correspondence. In modern times harbors have been constructed on even a larger scale than the three harbors mentioned, which successively served to receive the great ocean-borne commerce of Rome, but none of them ever possessed the same magnificence.

In addition to the discovery of the mummy of King Menepthah, the "Pharaoh of the Exodus," there have been other remarkable discoveries. The season was a productive one as regards exploration in Egypt. M. Legrani, while setting up the fallen columns of the temple, came upon a city gate, the first that has been found in Egypt; it is of great height and is made of large blocks of squared limestone and is double, having one gate within another. Two chariots could easily pass through it abreast. It was built by Amenhotep II. of the eighteenth dynasty. The Exploration Fund has been restoring the temple of Der-el-Bahari at Thebes, and one day while Mr. Carter, the inspector of antiquities in Upper Egypt, was riding up to the door of the house occupied by the excavators, he noticed that his horse's hoofs sank in a hole in the ground. Further investigation brought to light under the house the entrance to a large tomb of the eleventh dynasty in a perfect state of preservation.

Scientific American.

Correspondence.

"The Armor-Plate Fiasco."

To the Editor of the SCIENTIFIC AMERICAN :

Your article on page 370 on "The Armor-Plate Fiasco" is true in every word; not only that, but because of the foolish acts of Congress, the government has laid itself liable for more than half a million of dollars damages to the contractors for detention of their work and delay in delivering their ships.

The Cramp firm already have a large claim against the government for just such detention on account of non-delivery of armor, and they will collect it too, notat this Congress or the next probably; but it will be collected. Vide the large collections made by the contractors of the Civil War, and the claims for damages for all the present contractors are much more meritorious than any of those of the Civil War.

And from the expenses of navy yard work, no one believes that the government can manufacture armor for less than \$1,000 per ton.

Then, again, how about the up-keep of the establishment when we do not need armor ?

JOHN R. THOMAS. Washington, D. C., June 15, 1900.

Removing Foreign Substances from the Eye. To the Editor of the SCIENTIFIC AMERICAN :

A simple way of removing cinders or any foreign substance from the eye, is to gently hold the eye open with the fingers and thumb of one hand, while with the other hand to dash light handfuls of water in and across it, so as to produce a current of water flowing over all the surface of the eye, and the under side of the lids. The effect of this almost invariably is to push the intruding object from the eye.

This simple method should not be mistaken for washing the eye or immersing the face in water and opening and shutting the lids. Any misdirected help often tends to imbed an object so that the removal is difficult.

The eye should not be rubbed or one lid drawn over the other, or a silk handkerchief drawn across the affected part, but the eye should be kept from winking as much as possible while prompt action is being taken to cause a current of water to pass over the surface of the ball.

This method is a copy from nature, for when very fine dust enters the eye, nature seeks to relieve it by means of the fluids which moisten and lubricate the eye; and when larger objects enter, and cling more tenaciously, the irritation causes a copious discharge of tears so that the eye overflows, as nature tries by flushing it to propel along and float away with the current the cause of the irritation. М. Т.

Springfield, Mass., June 16, 1900.

[Our correspondent's advice, while excellent, will not, we think, answer in all cases. In turning metal on a lathe, chips are very apt to fly into the eye with considerable force, producing painful, if not serious, wounds. To add to the difficulty the chips are often hot. Water would hardly tend to dislodge foreign particles of this kind. It is also essential to have clean water for flooding the delicate tissues of the eye. Chips of metal in the eye are of such a serious nature that many eye hospitals have most powerful magnets for use in removing the chips.-ED.]

The Current Supplement.

The current SUPPLEMENT, No. 1278, has many articles of unusual interest. "The Mount Prospect Laboratory "describes the chemical and biological laboratories for the examination of Brooklyn (New York) drinking water. The various forms of apparatus for collecting samples are illustrated, as well as the portable ice chest for transporting the bacteria samples. "The Duddell Oscillograph" describes a most ingenious electrical testing instrument. "Liquid Air as a Means for the Manufacture of Oxygen" is by Prof. Henry Morton. "The Palaces of Fine Arts of the Exposition of 1900" is accompanied by two large engravings. "Hot Water Heating from a Central Station" is by H. T. Yaryan.

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RECENTLY PATENTED INVENTIONS.

Agricultural Implements. RIDING-CULTIVATOR. -- DANIEL V. FORSBERG, Laurel, Neb. Each shovel-beam of this riding cultivator can be quickly and conveniently adjusted by the hands of the rider, either to be raised or to be shifted sidewise. The shovel-beams can be vertically adjusted at their forward ends and held in adjusted position, enabling the beams to be set so that the shovels will enter the ground

to a greater or less degree. MECHANISM FOR OPERATING CUTTING AP-PARATUS OF MOWING-MACHINES,-JOHAN A. DAUGAARD, 1 Helgolandsgade, Copenhagen, Denmark. Contrary to the usual custom, no cog-wheels are used for transmitting the motive power from the axle of the machine to the connecting-rod actuating the knives of the cutting apparatus. A driven wheel has an undulated periphery engaged by two of the arms of a three-armed lever, the third arm being provided with a socket in its end, by which a pin carried by a lug is received. A cranklever has one member connected with the lug, the other member being connected with a pitman operating the cutter-bar. By regulating the length of the arms, the necessary movement of the knife can be obtained, even with very flat waves upon the rim of the driven wheel.

WEEDER.-LOUIS J. KLINGER, Dufur. Ore. This weeder comprises a short main frame attached to an axie. A draft-tongue is extended in front and rear of and beneath the frame, and is flexibly connected therewith. A cross-beam is rigidly attached to the rear end of the draft-beam and is provided with plows or scraping devices. The construction relieves as much as possible the strain put upon the draft animals and enables the weed-cutters to be readily raised or lowered.

Electrical Apparatus.

B. WARE and CHAUNCEY C. CORNELL, Wymore, Neb. les that may fall from the zinc elemer

nected in series with two adjacent sections of the second or switch conductor and controls the connection of the this system to overhead conductors, the inventor employs a special construction of supporting plates for the sectional conductors.

Engineering Improvements.

VALVE-GEAR FOR GAS-ENGINES. - CHARLES WERNER, Pine Grove, Penn. A spring-closed air-admission valve is employed, to which an arm is secured, provided with a catch. The catch is engaged by a hook carried on a rod reciprocated from the engine. Devices are controlled by the exhaust-valve-operating mechanism, whereby the engagement of the reciprocating rod with the air-admission valve is controlled and made to follow the opening of the exhaust.

Mechanical Devices.

FLOUR-BOLTER. - FREDERICK W. BROWN, Lee Bell, W. Va. The inventor arranges the bolting-chambers in triangularform, suspends them from the angles of the triangle, and locates the operating mechanism in the space formed by the chambers. Thus a compact bolter of great capacity is produced, which can be easily balanced to secure a uniform, gyratory motion without any backlash. Provision is made for supporting three bolting chambers from three links and equally distribut- OCHTINSKY, Rockvale, Colo. This invention relates to paratus is automatic. Arranged to prevent waste of ing the weight on the links. A portion of one chamber mining machines and provides a portable machine is made to serve as a housing for the cut off of the adjacent chamber, when the cut-off is withdrawn from over its bolting-cloth.

FAN ATTACHMENT FOR ROCKING CHAIRS .-FRANCIS C. and GEORGE E. MERTZ, Port Chester, N.Y. The object of the invention is to produce a device which is attachable to any rocking-chair and which ELECTRIC-BATTERY ATTACHMENT. - HENRY is adapted uniformly to rotate a set of fans mounted to turn upon the chair. The result is secured by the inser-This invention provides an insulated tray to be placed tion of a spring between the operating mechanism and between the elements of a gravity-battery to catch any the fan, the spring being wound up by the rocker and nin ามา

WIRE-TIGHTENER. - JAMES P. HADDIX, Merda, Neb. 'The wire-tightener comprises a frame having a rapidity than heretofore. All rattling is completely power-conductor sections with the feeder. In applying notched segment and feet for engaging a fence-post. An prevented. The coupling comprises a clip, having cheeks angular lever is fulcrumed on the frame and has forked which receive the knuckle of the pole. The clip has members. Notched bars are pivoted to the forked members of the lever and are adapted to extend on opposite cured to one of the pieces, the opposing piece being sides of a fence-post. A pawl is carried by the lever arranged for locking with and disconnecting from the and engages the notched segment in tightening the pin. In pivotal contact with a locking and an opposwire.

> CAN-FILLING MACHINE. - DAVID F. BALDAUF, Eden, N. Y. On a frame, shafts, geared together, are mounted. Cams are extended on the shafts in opposite PORTABLE directions and are designed to move frames at the ends of the machine. A tray holds the cans to be filled; and portable building can be constructed so as to be quickly a hopper feeds the material. The beans or other material are placed in the hopper. When motion is im- plurality of sections with mitered ends where they meet parted to the shafts, the tray and hopper are rocked up at the corners and square abutting ends where they meet and down alternately at opposite ends. This movement along the sides or ends of the building. Cast plates will cause the material in the hopper to spread out bolted to the wooden foundation have semicircular upevenly and pass into the cans.

> COMBINED LATCH AND LOCK.-LEWIS C. WET-ZEL, Bellefonte, Penn. This invention provides a novel gravity operated lock, so constructed that the sliding An angle iron on each section receives siding, so that latch-bolt serves as a locking-bolt which can be operated, when the pipe-posts are set in the projections, the pieces only from the outer side of the door by a suitable key. are fastened together. This supports the siding, posts The lock can be cheaply constructed and is efficient in and roof on the foundation. operation

MACHINE FOR UNDERMINING COAL. - ANDI adapted to be operated by hand and capable of easy shift mine the coal. The invention consists in special forms of devices for feeding the machine forward and for turning it laterally, and in other details of construction and arrangement of the parts.

TURBINE WATER-WHEEL .- JOHN W. TAYLOR, York, Penn. The object of the invention is to improve the construction of that class of turbines which receive the water upon the upper part of the buckets through stationary chutes surrounding the wheel, the admission of water being controlled by means of an annular or cvl indrical gate, adjustable to open or close the water inlets or chutes. The inventor provides a gate which is adapted to open downward and close upward, so that water is admitted at the top of the wheel, to produce the greatest effect practicable before being discharged from the wheel.

uncoupled from a vehicle with less trouble and greater an attachment consisting of side pieces. A pin us ing side piece, is a connecting bar. This bar carries a spring, the free end of which extends transversely

PORTABLE BUILDING .- JOHN C. KARR, 1020 East Ravenswood Park, Chicago, Ill. By this method a light, set up and taken down. The foundation comprises a ward projections at the section joints, and other plates have circular projections secured to the foundation with bolts, which have hooks at the end to catch brace wires.

ACETYLENE GAS GENERATOR .- WILLIAM BUR-ROWS MINOR, Deposit, N. Y. The operation of the apcarbid, the apparatus permits a ready recharging without danger of the escape of gas into a room, or without laterally and in an advanced direction as the picks under interruption of its generation. A supply-pipe and a series of generators are arranged to receive water; valves are adapted to govern the supply. Floats in the generators open and close the valves. A locking device at all the generators except the last, automatically holds the respective valves in position, and a connection between the locking devices and the float of the last generator allows the former to release the valves when the float is raised.

VENTILATOR. - CONRAD J. VOLLMER, Lafayette, Ind. The ventilator or grate in this device has a frame. Slats terminating at their upper ends below the top of the frame form a space between the frame top and the upper ends of the slats. The grate has a cover provided with slats for covering the spaces between the slats of the grate. It is free to move transversely through the space formed between the frame top and the upper ends of the grate slats. Lugs on the cover abut against the frame top to hold the cover in a nearly horizontal position. The ventilator is for use on buildings, and permits the passage of air to or from the part to be ventilated; or. allows its exclusion in winter time or during rainy weather HYDROCARBON - GENERATOR. - FRANCIS M. BAKER. Lomira, Wis. The device embodies novel is through separate conducting parts which are in contact to transmit the heat, and which upon being moved out of contact cease to pass the heat. In this way the generation of vapor is stopped. A wick feeds the oil or alcohol to the retort by capillary attraction instead of by gravity air-pressure.

thus preventing waste and the oxidation of the copper element, and maintaining an equal internal resistance of the battery and a uniform electromotive force.

TROLLEY. - JOHN H. WALKER, Lexington, Ky. The inventor has devised a simply-constructed trolley. harp and efficient means for catching and directing a trolley-wire into the groove of a trolley-wheel. Protracted cold weather will be but a slight impediment to the practical working of the device, for the exposed surfaces and bearings are so arranged as to afford ice but little opportunity to accumulate in the joints. The trolley-harp and catch device not only prevent a large percentage of the wear and tear of the wire and wheel, but also obviate the occasional expense caused by the pulling down of the wires and breakage of suspension-poles.

ELECTRIC RAILWAY .- Augost Casazza, Hoboken, N. J. The invention relates to a class of electric railways in which the cars or trains take their supply of electricity from a sectional power-conductor, the sections of which are successively connected with the live wire as the car or train passes over them. In Mr. Casazza's arrangement, a second sectional conductor is tudinally movable to engage the pinions. By this device several parts so that they can be conveniently applied to employed together with switches, each of, which is con- three separate machines can be operated.

FUEL-PRESS.-GEORGE W. MURPHY, Northfield, Minn. This press is designed to press straw into compact form for use as fuel. The apparatus has a spirallythreaded conical compression-chamber at the large or receiving end of which a plunger is mounted to reciprocate, serving to force the material to be compressed longitudinally into and through the compression-chamber, The thread of the compression-chamber serves to turn the material to be compressed, causing it to be rolled into compact form.

SPEED-GEARING.-ABRAHAM A. A. LEVIN, Manhattan. New York city. By means of this simple gearing the speed of an operated machine or device can be gradually increased over the speed of the driving-engine, thus saving steam. A series of independent main crankshafts are employed, on each of which a gear-wheel is mounted. Supplemental and independent crank-shafts are also employed. Connecting-rods join the cranks of opposite crank shafts. Pinions on the auxiliary crankshafts engage with the gear-wheels on the first-named

Miscellaneous Inventions.

WATER-COCK.-JAMES P. BENTON, 167 Second St. Dalles. Ore. The invention relates to water-cocks and fancets, intended for out-door purposes. The construction of this mechanism permits of the automatic bleeding or venting of the water of a stand-pipe. This is readily and completely effected without siphoning means for regulating the generation of the vapor, by transthe water in the hose back through the stand-pupe. It mitting to the retort the necessary heat. The transmission causes the bleeder to be put into action by the stand-pipe instead of by keys, thereby venting the pipe every time the water is shut off.

THILL OR POLE COUPLING .- ALBERT H. FOR-SYTHE, Sarcoxie, Mo. Mr. Forsythe, in this invention. crank shafts. On a power-shaft, gear-wheels are longi- improves upon a former coupling. He combines the

ARITHMETICAL SLATE.-HARRY CLAUD SEILER, | any axle, and so that the shaft can be coupled to or Milton, Penn. A slate-frame, a slate therein having