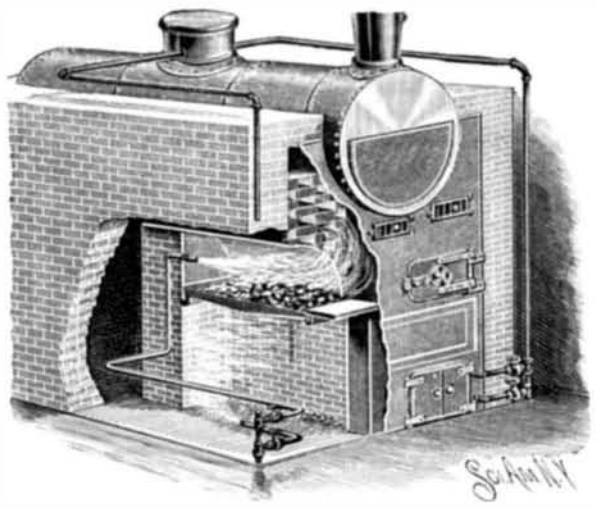
AN IMPROVED BOILER FURNACE.

The furnace shown in the accompanying illustration has a novel form of checker brickwork forming flues over the firebox and under the boiler, and is arranged for the discharge of steam in the firebox and under the grate to promote perfect combustion and insure a very high temperature. This improvement has been patented by Mr. Walter Hurdley, of Youngstown, Ohio.



HURDLEY'S BOILER FURNACE.

Although only one furnace is shown, any number of fireboxes may be arranged side by side in the brickwork, each of the fireboxes having a closed rear end and a semicircular top, the front open end of the firebox discharging into a space whose front portion is closed by the usual front of the boiler, while the top of the space communicates with the brickwork flues, which extend the length of the firebox. Behind the rear wall of the latter is an open space under the boiler, and to the rear of this space is a bridge wall, at the top of which are other similar checker brickwork flues leading to the rear of the boiler, whence the gases and products of combustion travel forward in the draught flues of the boiler to the chimney or smokestack. At the front of the furnace, directly above each filling opening, are draught openings closed by suitable dampers, and steam pipes from the boiler, controlled by valves at the side of the ashpit door, are arranged to discharge into the ashpit and firebox as shown. In starting the fire the ashpit doors are open, but when the firebox, which is preferably of metal, has reached a cherry-red heat, the ashpit doors are closed and the upper damper doors opened, at which time also the valves are opened for the discharge of steam under the grate and over the burning fuel. This style of boiler furnace is designed to be very effective for a wide variety of purposes, for use in connection with marine and stationary engines, etc.

A SALT SPRINKLER FOR TABLE USE.

A salt sprinkler designed to obviate the difficulty so frequently experienced in use from the salt becoming damp and caking is shown in the accompanying illustration. The improvement has been patented by Mr. F. N. Dixon, of No. 1611 Brown Street, Philadelphia, Pa. As shown in the sectional view, a follower and a spiral spring are contained within the holder. The spring is secured to the bottom and follower respectively, and operates to force the follower upward, to support the mass of salt, whatever its quantity, against and in contact with the cap. The cap is permanently swiveled upon the body so as to freely rotate upon it, having in the form illustrated a circumferential flange engaging a similar flange on the body. The cap may also be provided with small downwardly turned cutting edges. To operate the device, it is inverted and held with one hand, and the cap rotated backward and forward with the thumb and finger of the other hand. In such rotation or working the cap perforations and edges exert a positive grinding or shearing action upon the surface of the mass pressed against them, so that each movement of the cap compels a given quantity of salt to drop through the perforations. The bottom is secured to the body by a screw thread, and may be removed, together with the connected spring and follower, to fill the sprinkler.

IMPROVED STEAM WHISTLES.

In the steam whistle shown in Fig. 1 the central stem is done away with, and instead of the usual square top with acorn, is a dome-shaped top. The bell or tube is securely fastened at its lower end to a three-armed prong or spider, the stem of which is threaded to admit of being screwed into the base and there held secure by a jam nut. Owing to this construction the lower edge of the bell is always exactly in line with the slot in the base through which the stem escapes, insuring the best results and a perfect, clear, and loud tone. The bell can be raised and lowered to suit the steam pressure by screwing it up or down, and when properly set is fastened by the jam nut. It has been proved by practical tests that the prongs to which the bell is fastened do not interfere with the volume or quality of the sound.

In the combination or fire alarm whistle, shown in Fig. 2, a valve is already attached, making it very compact and simple. It is provided with a piston that can be moved up or down within the bell or tube, thus changing the interior length of same and consequently also the sound of the whistle. When the piston is not operated the whistle gives but one sound like any ordinary one, but when pulled up or down a series of howling, penetrating sounds is produced. When placed above the roof of a building, an extension rod should be attached to the piston and a rope or wire to the whistle valve lever. These whistles are manufactured by the Lunkenheimer Brass Manufacturing Company, of Cincinnati, O., U. S. A., under their own patents.

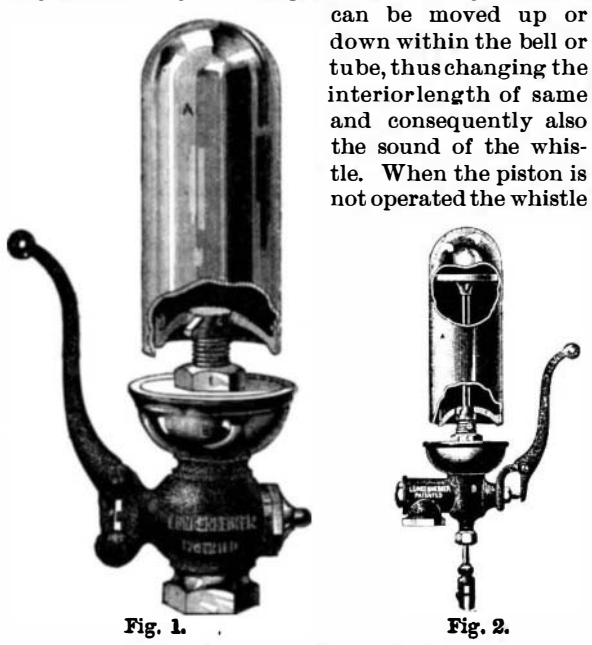


Fig. 1. Fig. 2.

IMPROVED STEAM WHISTLES.

IMPROVED METHOD OF HANDLING NITRO-GLYCERINE.

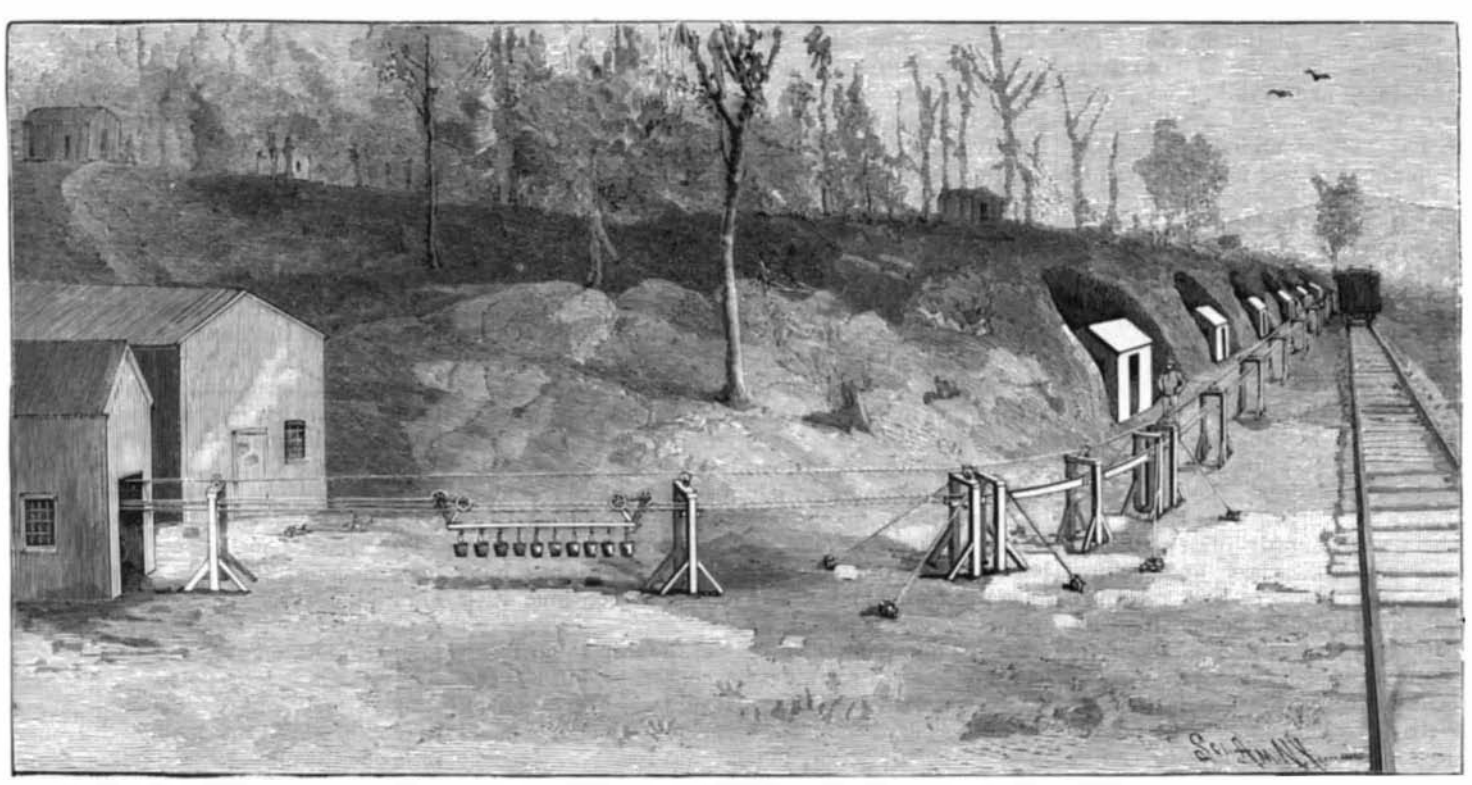
The dangers incident to the handling of nitro-glycerine in the manufacture of various grades of dynamite, giant powders, etc., have led to the introduction of the improved method shown in our illustration, which has been adopted at the Giant Powder Works, Hopatcong, N. J. The nitro-glycerine tank or storehouse, it will be seen, is situated some distance from the mixing houses, five in number. As formerly worked, the liquid was carried by lead piping from the tank house to the several mixing houses, but this method endangered the whole property in case of an explosion taking place at any point, as there was a chance of the piping communicating it to the different places about the works. In erecting a new plant, and in search of a safer method of carrying the nitro-glycerine, this matter was suggested to the Union Wire Rope Tramway Co., 117 Liberty Street, New York, who designed the arrangement shown in the view, the work being specially devised by Mr. S. A. Cooney, an engineer who has several patents on this method of conveyance.

DIXON'S SALT HOLDER AND SPRINKLER.

A double wire rope tramway is supported on framed towers, at sufficient height above the ground to allow a man to conveniently take off and put on the carriage the pails containing nitro-glycerine. The tramway is worked from an engine house close to the tank house, as follows: The engineer, or a man for the purpose, fills the different pails and hangs them on the carriage, which is started on its way to and stops at the first mixing house, the man in charge of which takes off two full pails, replacing them by two empties. On signal, the carriage goes on to the second mixing house, where the same operation is performed, and so on until it reaches the last, when all the empties are carried back to the starting point, and the operation is again gone over.

The tramway consists of two ⅝ inch steel wire ropes, supported every 50 feet on brackets attached to the frames. The curved portion of the line, about 40 feet long, is made with two wrought iron rails, the ends pointed and clamped with the ropes in special cast iron brackets to make the line continuous and prevent jars, special guide sheaves being placed at intervals around the curve to carry the hauling rope.

The carriage, specially designed for this plant, consists of two carriers connected by a ⅜ inch rod above and a bar below on which the pails are suspended.



TROLLEY SYSTEM OF CONVEYING NITRO-GLYCERINE—GIANT POWDER WORKS, HOPATCONG, N. J.

Each carrier has two 8-inch rubber-lined sheaves running on alternate ropes, to equalize any jarring and prevent explosions.

The first cost of the tramway, which is about 600 feet long, in comparison with a complete system of lead piping, is very much in favor of the former, which, with its designed immunity from the dangers of explosion, should commend this method to the attention of those engaged in the handling of high explosives.

ERUPTION OF THE VOLCANO OF ETNA.

On Sunday, July 10, an earthquake, followed by an eruption of Mt. Etna, caused considerable damage to the town of Nicolosi, on the south side of the mountain, and eight miles northwest of Catania. The advices show that the stream of molten lava flowing from the volcano increased in width and volume during several days, being near the crater over fifteen yards wide, and at a distance therefrom dividing into two streams. A large area of cultivated land has been laid waste and great destruction has been wrought among the vineyards. The villages of Nicolosi and Belpasso it was thought would doubtless be totally destroyed, and three days after the outbreak over twelve thousand people had left their homes and were encamped in the fields. Vesuvius is now also reported to be unusually active, throwing up lava abundantly.

The aspect of Mount Etna and vicinity since its eruption in 1879 is shown in the accompanying illustrations. Thriving cities, with numerous cupolas, are stretched out at the base of the mountain, and numerous villages, with long-pointed steeples, lie scattered over the lower region. These form a vast panorama, and terminate at a confused assemblage of conical hills, which formerly were so many craters. Above these we see rising, immense and majestic, the cone of the volcano, which overtops the clouds and forms the highest point of the island. The cultivated zone of Etna extends beyond 3,900 ft. elevation. From this limit vegetation rapidly grows poorer, and, toward an elevation of 6,500 feet, becomes very rare. However, up to the base of the central cone, that is to say, at about 10,000 feet, the vegetable kingdom is still represented by four small plants, whose botanical names are as follows: *Robertsia taraxacoides*, *Artemisia ætnensis*, *Senecio ætnensis*, and *Tanacetum vulgare*. The slope of Etna is very slight up to an elevation of 3,200 to 4,000 feet, and in general makes an angle of only 15 to 20 degrees with the horizon; beyond this it rapidly increases, but at 9,500 feet the inclination of the ground is suddenly interrupted by a sort of plain covered with black sand. This is the *Piano del lago*. At 1,300 feet to the north of this plain rises the cone of the central crater, at the foot of which is the astronomical observatory and the *Casa Etnea*, a small hotel designed for travelers who make the ascent of the volcano. The mouth of the crater of Etna is nearly 6,000 feet in circumference, since it was enlarged by about 1,800 feet at the eruption of 1879. The interior of the crater exhibits the aspect of a large cup filled with scoriæ and lava, among which are interspersed numerous fumaroles. At the bottom of the cup, at a depth of 200 feet, there is seen the aperture of the eruptive channel, which usually has a diameter of about 650 feet.

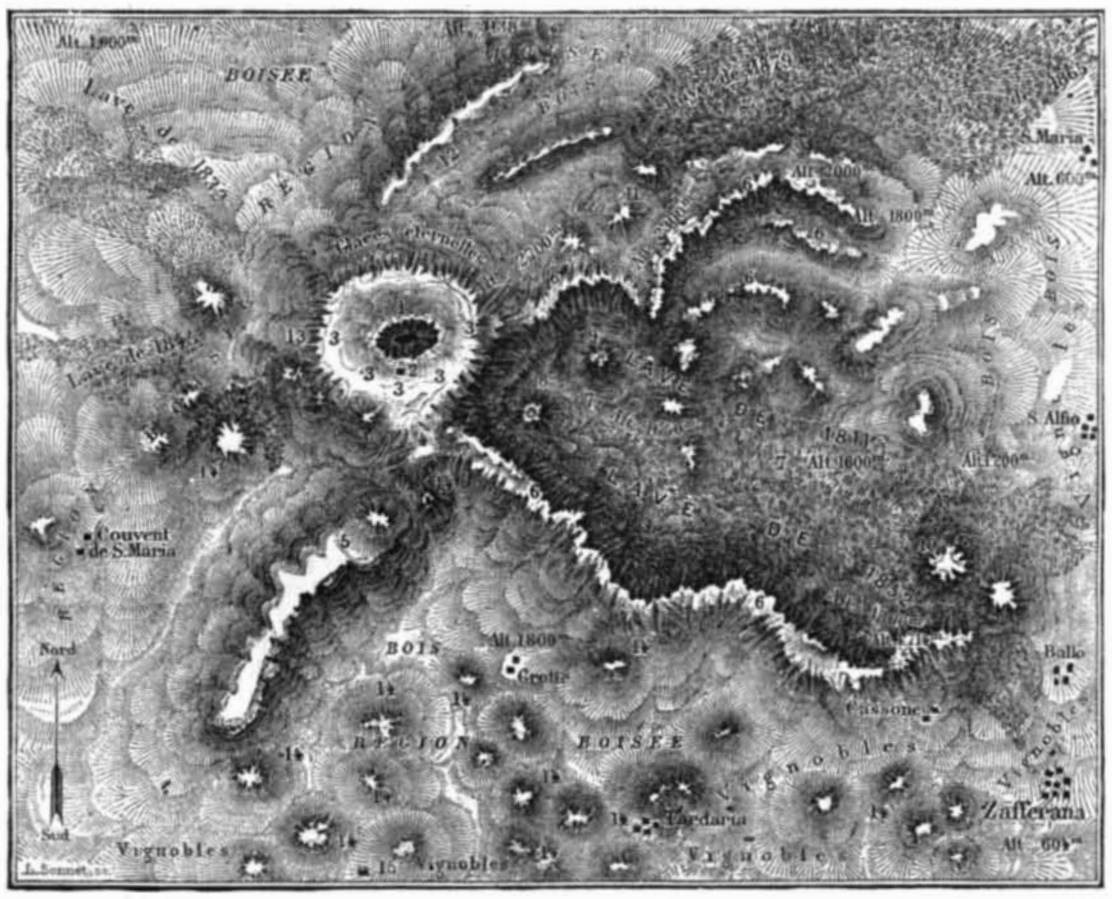
Mount Etna is situated on a tertiary formation, and is almost entirely composed of volcanic materials. On the eastern side of the mountain is a vast depression known under the name of the *Valle del Bove*, about six and a quarter miles long by three miles wide. Its depth at ome localities is more than three thousand feet, and its sides are surrounded at the north, south, and west by high rocks, several of which exhibit characteristics of aspect that are truly admirable.

Some of these rocks are formed of a very black lava, which well imitates antique serpentine. Others exhibit a color of a dark red, due to the oxidation of ferruginous matter. Moreover, the alteration of the mass of mineral is so advanced that it exhibits a whitish color similar to that of carbonate of lime, and there are also places where the lava is of a characteristic yellow color, which has caused the rocks wherein it is found to be styled *mountains of gold*.

Along with this, the rocky chains which border the Valle del Bove present a greater interest, in that they are almost all composed of several alternating strata of lava intermingled with banks of earthy materials and traversed in all directions by numerous veins of other and more recent lavas, the origin of which can be easily explained. For it is well known that when one of the sides of the mountain bursts to give passage to the incandescent matter, there results usually around the principal fracture other radiating fractures which decrease in size as they are prolonged to varying distances; and the liquid lava then penetrates these secondary fractures, fills them, and seals them up on solidifying. Thus, by examining the position of these strata and veins, there may be constructed a very extended chronology of the old eruptions.

The eruption of 1879 was considered by Prof. Silvestri, in a report made to the Italian government, to have been in a stage of preparation or partially suppressed development for a period of five years. It broke out May 26, there being craters on the north and south sides of the mountain, the latter having eight eruptive mouths, but the stream on the south side of the mountain did but little damage. From the eruption on the north side, by the evening of May 29, the lava had flowed 6¼ miles, destroying the bridge of Passo Pisciaro and crossing the postal road between Randazzo and Linguaglossa. After the evening of June 1 the force of the eruption began somewhat to abate, and by June 6 it was practically at an end. The lava stream ran nearly seven miles from its source, and ultimately stopped 500 yards from the River Alcantara, and about half a mile from the village of Mojo.

At its termination it is 23 feet in breadth and nearly 32 feet in height. The lava stream entered the bed of the Pisciaro torrent with a velocity of from four to five meters a second, which was reduced to two meters a minute in the lower valley of less inclination In seventy-six hours the lava had flowed more than six miles from its source.



1. Central crater (16,800 feet altitude). 2. Astronomical observatory. 3. Plain of the Lake. 4. Montagnola (8,660 feet). 5. La Schiena dell'Asino. 6. Rocks bordering the Valle del Bove. 7. Valle del Bove. 8. Eruption craters of 1852. 9. Crater of 1811. 10. Monte di Calanna (4,200 feet). 11. Craters of 1879. 12. Valle del Leone. 13. Other craters of 1879. 14. Ancient craters. 15. Casa del Bosco.

MAP OF THE UPPER REGIONS OF ETNA.

1. Edge of the central crater. 2. Astronomical observatory. 3, 3, 3, 3. Rocks bounding the Valle del Bove. 4. Mount Rossi. 5. Village of Nicolosi.

MOUNT ETNA SEEN FROM THE PORT OF CATANIA (SOUTH SIDE).

A New Process for Enameling Silver Prints.

BY DR. LEO BACKLAND.

This process gives a better finish to the prints and renders these waterproof. Such enameled prints can be easier mounted than by the usual methods, and when being mounted the gloss is not decreased by the application of paste.

Clean glass plates are rubbed in with talcum as for the usual process and then afterward the plates are collodionized with collodion containing 1 per cent gun cotton. When the layer of collodion is perfectly dry, the plate is coated a second time with a solution of rubber in benzole. This solution is easily made by dissolving 1 ounce of unvulcanized Para rubber in 100 ounces of benzole and straining through muslin after complete dissolution of the rubber. When the India rubber coating is dry the so prepared plate is ready for receiving the print. If the print is on albumen paper, it is soaked in a warm ten per cent solution of good gelatin, after which it is applied with its surface on the prepared plate, softly squeegeed upon it and then allowed to dry, and when strictly dry it is stripped off in the usual way.

Prints on aristotype paper can be enameled with much less trouble by squeegeeing them simply when wet on the glass plate coated with collodion and rubber and slipping them off when dry.

A Big Model for the World's Fair.

At the World's Fair at Chicago, next year, will be a complete model of the entire plant of the H. C. Frick Coke Company, of Scottdale, Pa. This company employs many million dollars capital in their business, and is the largest of the kind in the world. The contract for the model has been let to the Jones Bros. Company, of Cincinnati, Ohio, who are experts in the making of models. Its estimated cost is between three and four thousand dollars. The plant will occupy a space about 20×50 feet, made on scale of one twentieth of an inch to the foot, and will be an exact facsimile of the original, including boilers, engines, piping, elevated tracks, cupolas, cars and all other machinery, and will be in operation. The motive power, however, will be electricity.

BRICKS are extensively manufactured in Japan for home consumption, but a small quantity has been exported as a venture to Vancouver, and should the demand there justify further exportations, bricks could be shipped thither as ballast at nominal rates. Mr. Layard mentions that the wages paid at the largest of these factories range from 20 to 25 cents per day for men, and from 10 to 15 cents per day for women.