

Correspondence.

The Recent Boiler Explosion near Pittsburg.

To the Editor of the Scientific American:

The U. S. Local Steamboat Inspectors have completed their investigation of the explosion of the boiler of the steam tug *M. Dougherty* near here on Jan. 11. Their report is an indorsement of the Lawson theory of boiler explosions. The tug had landed to repair a broken valve stem. To facilitate that work, as the throttle leaked, a valve connecting the steam drum and steam pipe was closed. After lying at the shore perhaps thirty minutes, the water in the boilers was tried and showed scant three gauges. The steam gauge showed 170 pounds. The safety valve was tried and found clear. The work of repairing the valve stem being about completed, a deck hand was sent to open the valve at the steam drum. It was at that time that the explosion occurred.

In support of their finding, the inspectors, by the evidence adduced on their investigation, show that no deluge of water followed the explosion, and that the body of the deck hand was found abreast and 120 feet out in the river from the place occupied by the tug at the time of the explosion. The upper part of his clothing was torn away. The theory of the explosion is that upon opening the valve at the steam drum the pressure on the highly heated water was suddenly relieved, and it burst into steam. Rushing through the steam pipe it met with a check at the closed throttle. A concussion that no material could withstand resulted.

F. C. N.

Pittsburg, Pa., Feb. 1, 1885.

Electricity for Executing Criminals.

A few years ago there appeared in these columns an article suggesting the substitution of electricity for the scaffold and rope in the execution of criminals. A number of letters on the subject followed our editorial, and, if we recollect aright, several patents were granted on appliances for accomplishing the object.

The subject has come up again by Governor Hill, of New York, asking if "Science of the present day cannot provide a means of taking the life of such as are condemned to die, in a less barbarous manner?" To which the *Electric Review* replies: "What more scientific method can be devised than the application of electricity as an executioner? Persons who have read the series of interviews with electrical experts which have recently appeared in this journal [*The Review*] must have observed that an electrical current of 1,000 volts is considered the maximum which the human system can receive without fatal results, whereas the wires which feed the lamps with which our streets are lighted carry a current of 2,300 volts. How simple a process it would be to connect the place of execution in the Tombs with the system of electrical street illumination, so that electricity could be made the executioner of murderers! The criminal would be placed in a chair, with his head bound back against a bulb at the end of the wire through which the fatal shock would be communicated, and it would be possible to furnish the death seat with an automatic attachment so that the execution could be effected at a given moment by the action of a clock-like apparatus, and without the least movement of the hand of the officer charged with the infliction of the death penalty.

"What more scientific method than the one here proposed can be devised? Death would be instantaneous and perfectly painless, while at the same time the awfulness of the penalty thus inflicted would be profoundly impressive."

Balloon Ascension at Philadelphia, Jan. 19.

Sergeant Hammond, of the U. S. Signal Service, made an ascension with Prof. William S. King, from Philadelphia, at 4:15 P.M., Jan. 19, the capacity of the balloon being 25,000 cubic feet of gas. The wicker car was 6 feet long, 4 feet wide, and 2½ feet deep. The starting had been delayed, and was near being postponed for the day, on account of the low temperature. The balloon reached a height of 5,800 feet, and after being carried by brisk winds in several directions, finally landed about 50 miles southeast of the point of starting, near the Jersey coast, at 7:05 P.M. This is one of several trips to be made on behalf of the Signal Office, meteorological instruments being taken for making observations at various heights. It was too dark to make some of the desired observations during this trip, and it is proposed hereafter to provide the aeronauts with an electric light.

OLIVE OIL.—If fatty oils are cooled down to -20°, and kept at this temperature for three hours, they assume very different degrees of hardness, olive oil being the hardest. To determine this point the author uses a cylindrical iron rod, 1 centimeter in length, and ending below in a cone. Upon it is exerted a pressure measured in grammes until it penetrates into the oil with its entire length. The best olive oil required a pressure of 1,700 grms., while cotton oil required only 25 grms. —*Serra Carpi*.

A Model Fast Cruiser.

A practical turn has been given to the criticism on the navy by the submission to the Admiralty of a design for a barbetted cruiser, the chief attributes of which are great speed, powerful guns, long steaming power, and unusual buoyancy. The designer is Mr. Pearce, of Fairfield Shipbuilding Yard; and although the vessel is a novelty when compared with the war ships of the present day, it is in reality nothing more than a development of the fast American liners, and an adaptation of their hull and machinery to the express purpose in view. The essence of the design lies in the speed, and it is concerning this quality that the designer can speak with authority. It has unfortunately happened in the immediate past that defective sailing qualities have been the chief characteristic of the British navy. Not only are the vessels unable to go fast, but they are capable only of steaming the shortest distances. Mr. Pearce's design contemplates a speed of 21½ knots per hour, or about 25 ordinary miles, and a coal capacity for steaming as far as the West Indies and back at a speed of 12 knots per hour. This high and enduring speed will be given in conjunction with great offensive power and great staying power. The design contemplates the vessel being pierced by 100 shots and still being able to use her guns or steam off at full speed.

What may be described as the vitality of the ship, its power of endurance, and its maintenance as a floating object, is secured by an elaboration of the cellular system of construction. The hull would consist of 122 water tight compartments. A bulkhead would extend down the center of the vessel for its whole length of 410 feet, and three transverse bulkheads would, with the center bulkhead, divide the vessel into eight main water tight compartments. Each of these transverse bulkheads would run from the skin of the vessel to the bulwarks, and would be carried up and be joined to a deck of steel. The foremost of these transverse bulkheads is in the form of a collision bulkhead, the second runs from the after end of the engine room by a middle line bulkhead, and the third runs up from the stuffing box carrying the screw shaft in the stern. This will give six large water tight compartments and four small.

Those at the fore part and those at the stern will contain nothing of vital moment either to the buoyancy or the locomotion of the vessel. The four other compartments will contain two complete sets of boilers and engines, each with its screw shaft and screw propeller, and each set being completely cut off from the other by the middle bulkhead running the whole length of the vessel. The mechanical arrangements are designed upon the basis of the possibility of the whole of one side of the ship being disabled without resulting in the destruction of the vessel. Not only would she float, but she would float well, and would still have the means of a comparatively high speed. But in addition to these separate water tight compartments, the vessel is still further protected by the hull being divided up into an extremely large number of small compartments. The whole of the hull has a double skin, and the girders joining the inner and outer skin form water tight compartments throughout the entire hull.

The steel deck, covering in the six large water tight compartments, is 3 inches thick, and is placed 5 feet 6 inches below the water line. It forms an arched roof, inclosing all the vital parts of the vessel—the engines, boilers, and screw shaft; and the means of access to the engine room is by a protected coffer dam running to the upper deck. The coal bunkers for serving the vessel are placed all along the sides of the ship, and occupy a space of from 10 feet to 15 feet in thickness. These coal bunkers are also divided at intervals of from 16 to 20 feet with bulkheads, primarily for the purpose of keeping the coal from shifting, but also for restricting the passage of water in the event of a ball having penetrated the compartment. There would thus be around the inner water tight compartments containing the vital parts of the ship a double skin, consisting of a great number of compartments, all of which might fill without sinking the vessel. The inside of these bunkers measures about 80,000 cubic feet; any one of them may be penetrated and filled with water in addition to coals without endangering the life of the vessel, and there is no projectile yet in existence that would penetrate through this double outer skin, the inner armor of coal, and the inner skin, to the inmost compartment. It is not proposed to put any armor on the bottom of the vessel, simply because the chances of attack from that quarter are practically reduced to nothing by the high speed.

The engines and boilers have been designed with a view to procure the maximum of power with the minimum of weight. The engines themselves would be constructed mainly of steel and manganese bronze, and in form they would be almost identical with those of the fastest American liners now afloat. In conception they would be precisely similar to those of the Alaska, the Oregon, and the Umbria, produced by the same builder, and the arrangement would be similar to the set of twin engines and twin screws recently dispatched to Italy from the Fairfield works for the *Francesca*

Morosini, now being built by the Italian government at Venice.

The engines of the *Francesca Morosini* are calculated to develop 2,000 horse power more than any vessel at present in Her Majesty's navy, and for their power they are the lightest engines ever built. The engines, boilers, and propellers being an exact duplicate, wholly independent of each other, and each incased in their own water tight compartments, the use of sails becomes unnecessary, and there would be nothing required for purposes of locomotion to show itself above the deck. A military mast, however, forms part of the design, made of steel and hollow in the middle to permit the ascent and descent of marines for the purpose of working the machine guns placed upon the large military top. The main means of offense, however, is provided by a couple of barbettes. These are to be armor plated with steel plates of 11 inches, giving 13 inches thickness on a horizontal line.

The scheme contemplates the placing of 110 ton breech loading guns in each barrette, or two 65 ton guns. Arrangements are also proposed for placing eight 6 inch long range guns—four on each side of the vessel—amidships. Guns of this capacity would carry a distance of five miles, and given five miles as the utmost range, and given also a speed of 25 ordinary miles per hour, it will be seen that two minutes after a shot had been fired the vessel could be steamed to a distance of 6 miles from the object of attack, and quite out of range of the enemy's guns. The magazine and shell rooms are to be placed directly under the barbettes, with a hydraulic lift between them and the guns. Another element of attack consists in the torpedo room, which it is proposed to place in the forward part of the ship and in direct communication with the ejection tube. The precise dimensions of the proposed cruiser are:

Length, 410 feet; breadth, 64 feet 3 inches; and depth, 38 feet 6 inches. The displacement at a draught of 28 feet would be 10,500 tons, and at a draught of 25 feet 6 inches, 9,600 tons, with an indicated horse power of 18,000. The plan, with complete specification and a model, is now being considered by the Admiralty.—*London Times*.

Sleeplessness.

Sleep is a perfectly natural function. It is not a negative act, but a positive process. Herein lies the difference between real sleep and the poison-induced torpor which mimics the state of physiological rest. We ought to be able to sleep at will. Napoleon and many busy men—the late Mr. Wakley, for example—developed the power of self-induced sleep to such an extent as to be able to rest whenever and wherever they pleased, for longer or shorter periods, as the conditions admitted. We have been led to believe that Mr. Gladstone at one time possessed this faculty. If that be so, his recent insomnia must be assumed to have been the result of such intense brain worry as inhibited the control of the will; or there may, of course, be physical causes which render the apparatus of the cerebral blood supply less manageable by the nerve centers.

In any case, it is much to be deplored that, in the study and treatment of insomnia, the profession generally does not more clearly and constantly keep in memory that what we call sleeplessness is really wakefulness, and that before it is justifiable to resort to the use of stupefying drugs the precise cause of disturbance should be clearly made out. This, of course, takes time, and involves a scientific testing of the relative excitabilities of the sense-organs, central or radial and peripheral. The discovery of the cause, however, affords ample recompense for the trouble of searching for it. With the sphygmograph and a few test appliances, such as Galton's whistle, an optometer, and other instruments, the recognition of the form and cause of sleeplessness can be made in a brief space, and then, and then only we protest, it can be scientifically—i. e., physiologically—treated.—*Lancet*.

The True Source of the Mississippi.

Captain Willard Glazier, of the U. S. Navy, in June, 1881, organized and led an expedition with the object of finally settling the matter. The expedition proceeded in canoes via Leech Lake to Lake Itasca, and, accompanied by an old Indian guide, pushed forward to the south; and the captain was rewarded by the discovery of another lake of considerable size, which proved to be, without the shadow of a doubt, the true source of the Mississippi. It is in latitude 47° 13' 25", and the lake is three feet above Lake Itasca, the hitherto supposed source of the river. The Mississippi may, therefore, be said to originate in an altitude 1,578 feet above the Atlantic Ocean, and its length, taking former data as the basis, may be placed at 3,184 miles. The tract of country in which the river originates is a remote and unfrequented region.

ELECTROLYTIC DETECTION OF MERCURY.—The author has devised an apparatus by which it is possible to detect the 1-100 mgrm. of mercury in 100 c. c. of a liquid. The cathode consists of a pencil of fine silver wire, electroplated, upon which the mercury is deposited.—*C. H. Wolff*.

A Subterranean River.

A correspondent of the London *Times* says that the underground phenomena found in certain portions of the southern and Adriatic provinces of Austria, including miles of underground caverns, lakes that disappear and reappear at regular seasons, and rivers that are swallowed up by the earth, and come to the surface again many miles distant, have recently been the object of much attention on the part of the Austro-German Alpine Club and of the Club degli Alpinisti, of Trieste. A section of the members of the former body determined, some time ago, to institute a systematic exploration of the subterranean course of the river Reka. Rising in the Schneeberg, in Carniola, this mysterious stream suddenly disappears in the so-called Karst caverns. At San Giovanni di Duino, twenty miles distant from the spot where the Reka is lost, a river of corresponding magnitude is found issuing from the foot of a hill. This stream is known as the Timavo, which takes a westward course, and discharges its waters into the Bay of Monfalcone. As to the identity of the Timavo with the Reka there cannot be a doubt, although until the present year no attempt had ever been made practically to demonstrate the fact. The members of the Austro-German Alpine Club, who had resolved to explore the underground meanderings of the river, made their preliminary reconnaissance on March 30 last.

Starting from the first great cavern, called the Rudolph's Dome, the expedition, consisting of four persons in two boats, proceeded on their eventful voyage.

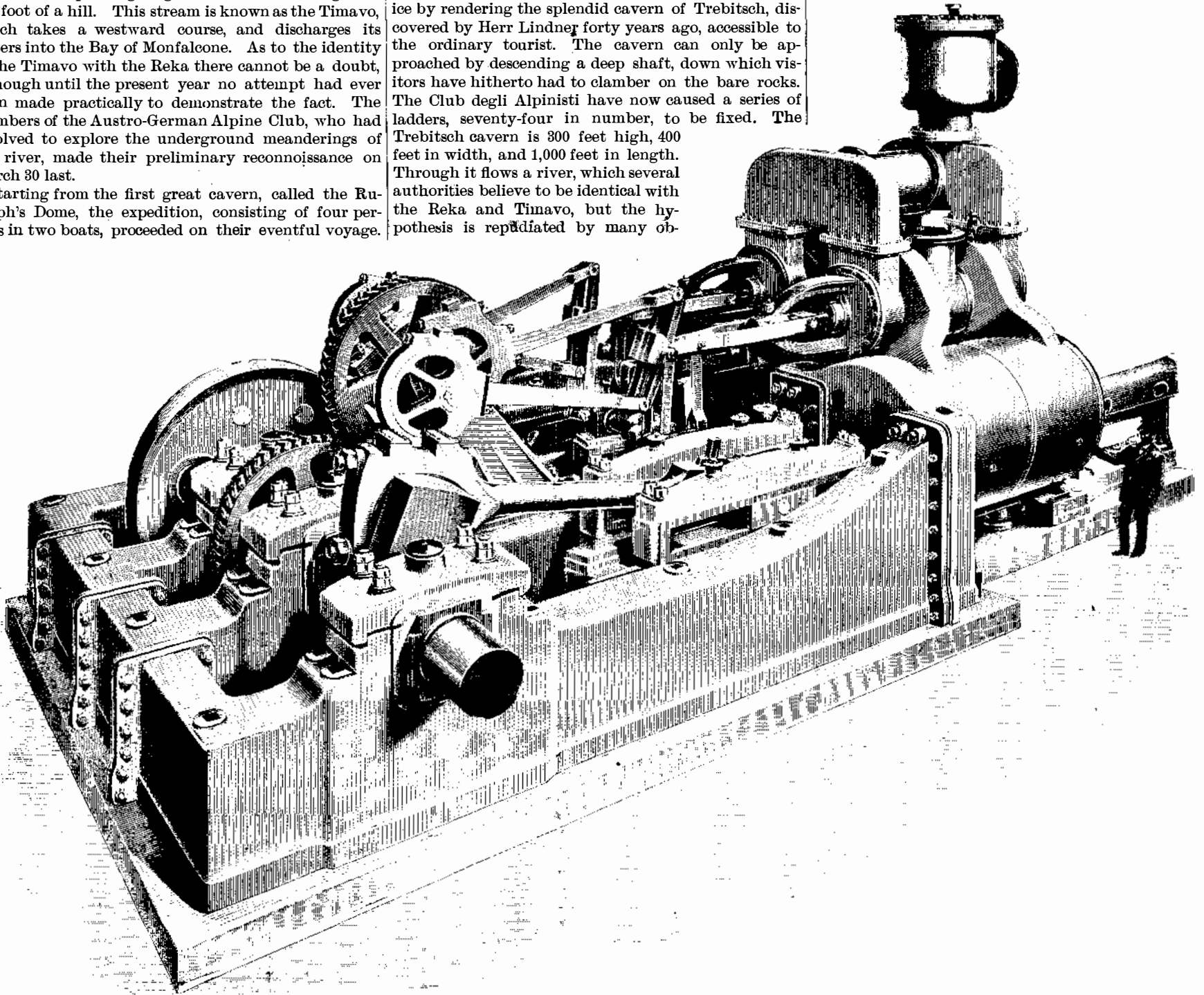
vancing some distance beyond it. They soon, however, came to a seventh waterfall, where they were compelled to turn back. They found that to make any further progress it would be necessary to get a boat past the last waterfall, as there is no standing room on either side of the stream, but sheer perpendicular walls of rock. The further exploration of the underground river will be resumed as soon as the requisite apparatus can be got ready. In the mean time the Alpine Club has decided to make the approaches to the Rudolph's Dome cavern more easy of access to the general public. The second cavern, which was discovered in September, is of far greater dimensions than the Rudolph's Dome, or any of the other caves of this district. Its height is upward of 450 feet, so that it could easily contain the Cathedral of St. Peter's at Rome.

With regard to the Italian Alpine Club, its committee has, during the past summer, done some good service by rendering the splendid cavern of Trebitsch, discovered by Herr Lindner forty years ago, accessible to the ordinary tourist. The cavern can only be approached by descending a deep shaft, down which visitors have hitherto had to clamber on the bare rocks. The Club degli Alpinisti have now caused a series of ladders, seventy-four in number, to be fixed. The Trebitsch cavern is 300 feet high, 400 feet in width, and 1,000 feet in length. Through it flows a river, which several authorities believe to be identical with the Reka and Timavo, but the hypothesis is repudiated by many ob-

Finally the nose improver is fixed on and the sides clasped together, and the wearer keeps it on all night, taking care in the morning to wash in cold water only. It is a rather painful process at first, but after the first two or three applications of the improver there is no more trouble. In about a month the nose begins to take its new shape, and at the end of from eight to ten weeks the alteration is said to be perfect and permanent, that is, until the patient becomes tired of that particular shape and is desirous of having another, when the same operation with another instrument is applied. I have known people," continued the surgeon, "change their noses four or five times in as many years."

IMPROVED RAIL MILL ENGINES.

We publish perspective views of a very fine pair of reversing rail mill engines at the works of the Dowlais

**IMPROVED SIXTY INCH RAIL MILL ENGINES.**

From the cavern just mentioned the river flows for 200 feet through a narrow channel between two perpendicular walls of rock, estimated to be upward of 100 yards in height. At the end of this channel the explorers, whose course throughout was illuminated by the magnesium light, found themselves in a vast cavern, where they were able to land. Fastening up their boats, they proceeded for some distance on foot past several cascades and rapids. They followed the course of the stream without much difficulty for a considerable distance, after leaving the newly discovered cavern, keeping to the left bank at first. At length they reached a spot where the river contracts to a width of barely twelve feet. Here they were compelled to cross to the right bank, which they did by help of a wooden ladder they had with them. The advance now became more difficult, the explorers being only able to get forward by creeping and climbing. At length they came to the sixth waterfall, which the party was unable to pass. The river here runs between two perpendicular walls of rocks, and suddenly takes a downward leap of over 20 feet.

From the Rudolph's Dome, where the start was made, to the sixth waterfall, the distance is rather over a furlong, and requires half a day to accomplish. At the third attempt the four gentlemen forming the expedition succeeded by help of suitable ladders and other apparatus in getting over this cataract, and ad-

servers. The question can only be settled when the Austro-German Alpine Club shall have accomplished the interesting task it has taken in hand—that of following the subterranean course of the river Reka from its beginning to its termination.

Changing the Style of Noses.

Several weeks ago an engraving of a contrivance for straightening crooked noses was published in these columns. It now appears that a Frenchman invented a machine some years ago for changing the style of noses, by which it is said he amassed quite a fortune. A representative of the *Philadelphia Times* recently interviewed a surgeon on the subject, and learned the following:

"The nose is simply a piece of cartilage, and its shape can be changed with ease. Many people are troubled with noses whose shapes do not please their owners or their owners' friends. The French machine consists of a small shell in two parts, hinged together. It is made of iron, japanned or enameled. It is in shape inside that of a perfectly moulded nose, according to the type of the features of the wearer. Thus you can obtain a Roman, Grecian, retroussé, aquiline, or any other shape you desire. To apply the instrument, the nose is first bathed in warm water at bedtime and thoroughly heated and softened. Then it is well greased with olive oil, glycerine, vaseline, or other oily substance.

Iron and Coal Company, these engines having been constructed by Kitson & Co., of Leeds. We are indebted to *Engineering* for the engravings. The engines have 60 in. cylinders with 5 ft. stroke. The engravings are prepared from photographs, and the man shown in one of the views by the side of the engines will enable the size of the latter to be better appreciated.

Galvanic Action as a Preservative.

At the present time, when so much has been said and written concerning the influence of galvanic action on fermentation and beer, it may be of interest to recall an experiment made by Andrew Crosse some years ago. He found that by subjecting milk to electric action it could be kept sweet for weeks together. He used the following simple arrangement:

"Two cylinders of sheet zinc and sheet iron were severally placed in two porous earthenware tubes, open at the top, but closed at the bottom, the same being filled with water, and these were connected at the top by a copper ribbon; the earthenware vessels were then placed in the fluid (milk or otherwise), and the electrical action commenced immediately, and the fluid became antiseptic in a few hours."

It is recorded that milk has in this way been kept sweet for three weeks in the middle of summer. It would seem that in this case the galvanic action was