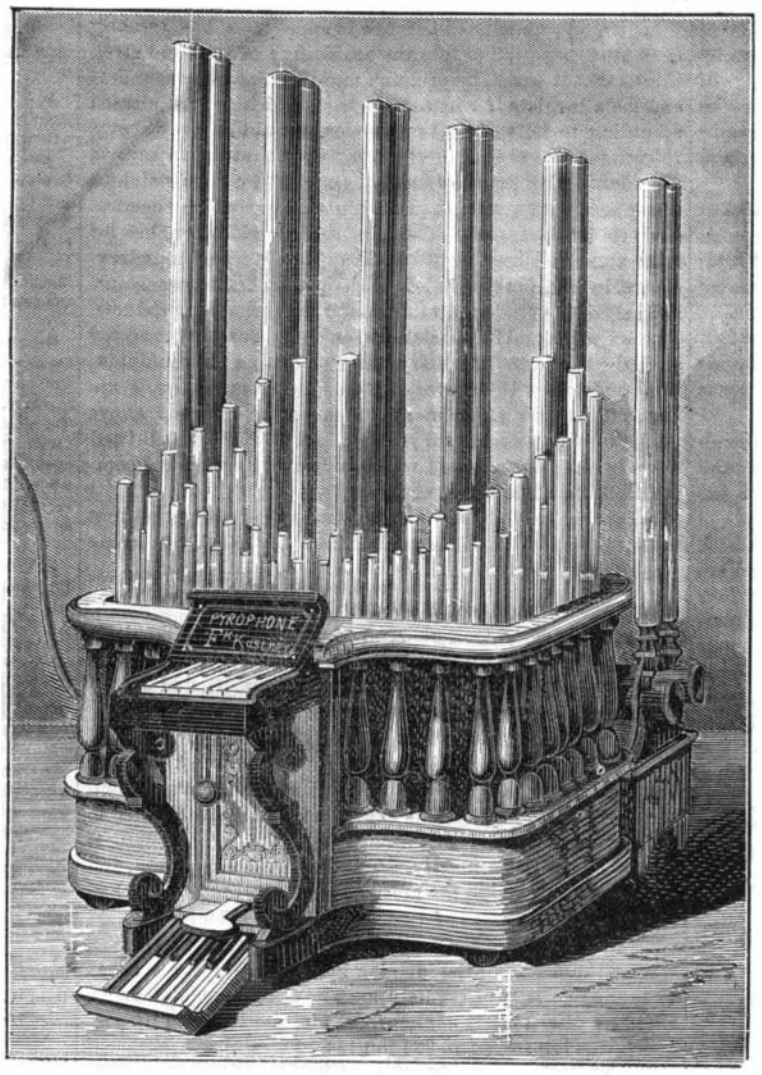
THE PYROPHONE.

M. Frederic Kastner, of Paris, has recently devised a novel and very remarkable musical instrument, which, it is said, produces astonishing effects even in the midst of the largest orchestras. It is termed by its inventor the pyrophone, and we present herewith an engraving of it, taken from *La Nature*. The origin of the device is due to the curious discovery made by M. Kastner in the properties of singing flames. Many scientists have studied these interesting phenomena, but the peculiarities of two flames in conjunction seem to have escaped their notice. As a result of his investigation, M. Kastner finds that if, in a tube of glass or other suitable material, two or more isolated flames of proper size be introduced and located at a point corresponding to one third the length of the tube, reckoning from the base, such flames will vibrate in unison. The phenomenon continues as long as the flames remain separate, but the sound ceases the instant they are brought in contact.

The pyrophone, at first sight, resembles an organ; but instead of being operated by air blown in, it produces its notes by the singing of the flames within the tubes, the quality of the sound, its pitch, and intensity depending of course on the dimensions of the latter. The burners from which the flames emerge are so arranged that the flames run together, but may be separated instantly by pressing down a key on an ordinary key board, seen in front. The position of the key in relation to the sound is the same as upon the piano or organ. According to the law above cited, as soon as a key is pressed the separated flames, in the corresponding tube, give forth a note, continuing, as in the organ, as long as the key is held down.

It is said that the music thus produced is extremely beautiful, and that the sound close resembles, in delicacy and purity, that of the human voice.



THE PYROPHONE.

Condensation in Steam Cylinders.

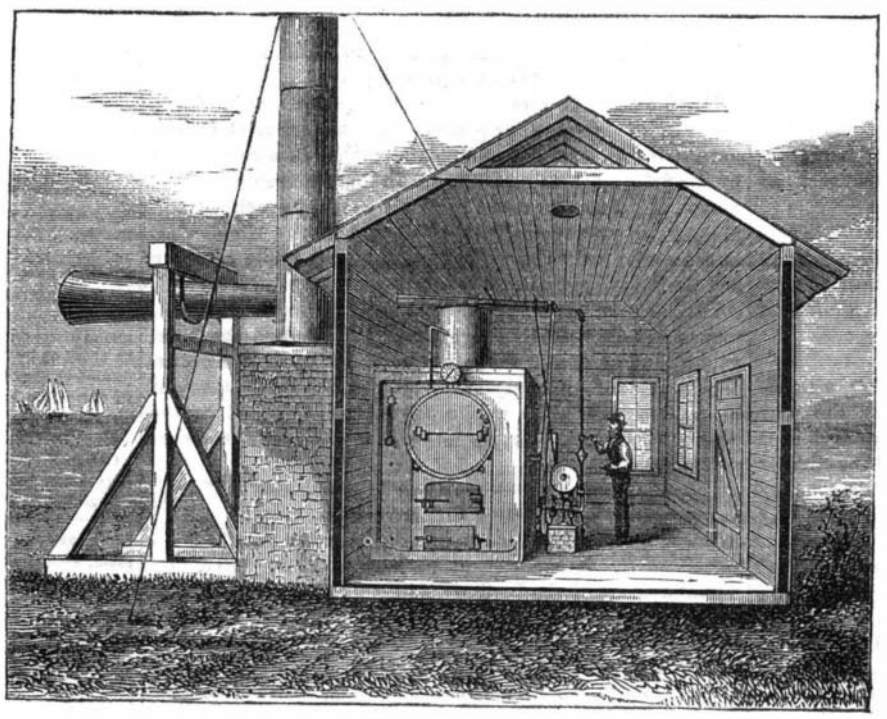
By the use of lead facings to pistons and cylinder lids, a considerable economy in the use of steam may be effected. An iron lid and piston will, other things being equal, condense more than three times as much steam as a lead-faced piston and lid. The thickness of metal heated and cooled at each stroke is not considerable, and not far into the metal, a zone of constant temperature, lower than that of the steam, will be found. The distance from this zone to the inside of the cylinder will depend on the conducting power of the metal, and will be about 9 for lead to 12 for iron. It may be shown that, in any case, the thickness of the lead facing may be kept within very moderate limits. Other materials may be used for the same purpose, as, for instance, tin, the specific heat of which is 0·562, its specific weight being a little less than that of iron. Its conducting power is, however, in excess of that of iron, being as 15 is to 12. Slate or hard pottery ware might also be employed, but on the whole the balance of advantage appears to lie with lead.—*The Engineer*.

THE STEAM SIREN OR FOG HORN.

Fog signals, many of which are required at different points on the Atlantic and Pacific coasts, are of several kinds. Some are steam whistles, the sound of which is made deeper or louder by being sent through a trumpet; but the most effective is probably the siren. This ingenious machine consists of a long trumpet and a steam boiler. The sound is produced by the rapid revolution past each other of two flat disks pierced with a great number of small holes; a jet of steam under high pressure is projected against the disks, which revolve past each other more than a thousand times a minute; as the rows of small holes in the two disks come opposite each other, the steam vehemently rushes through, and makes the singular and piercing noise which a siren gives out. One of these machines, of which we give an illustration, costs about $3,500 complete, with its trumpet, boiler, etc.

Daboll's trumpet is worked by an Ericsson engine, and requires no water for steam.

Congress rightly has great confidence in the scientific skill and integrity of the Lighthouse Board. At the last session, besides the usual appropriation for the maintenance of the lighthouse system, it gave the money needed to build forty new lighthouses and ten steam fog signals. If we ever have a merchant marine of our own again, our seamen will find the stormy and rock-bound coasts of their country well lighted for them.—*Harper's Magazine*.



THE STEAM SIREN OR FOG HORN.

PRODUCTION OF LIGHT IN STONES.—When various kinds of hard stones are pressed by the workmen (with their hands) against quickly revolving grindstones, the transparent stones become pervaded throughout with a yellowish-red light, like that of red hot iron. Opaque stones give a red light, at the place of contact, with halo and sparks. Dr. Nöggerath thinks the phenomenon worth studying by physicists.

India Rubber for Steam Pipes.

As india rubber plates and rings, says the *Journal of the Franklin Institute*, are now used almost exclusively for making connections between steam and other pipes and apparatus much annoyance is often experienced by the impossibility of effecting an airtight connection. This is obviated entirely by employing a cement which holds equally well to rubber and metal or wood. Such cement is prepared by a solution of shellac in ammonia. This is best made by soaking pulverized gum shellac in ten times its weight of strong ammonia, when a shining mass is obtained, which, in three or four weeks, will become liquid, without the use of hot water. This softens the rubber, and becomes, after volatilization of the ammonia, hard and impermeable to gases and fluids.

Mineral Statistics of Great Britain for 1873.

The London *Times* gives the following statistics, showing the metallic and mineral productions of Great Britain for 1873. The total value of metals mined is $110,800,000; of minerals, pottery materials, etc., $9,000,000; of coal $531,400,000. Total, $651,200,000. The excess of value over 1872 is about $66,400,000, and is due to the influence of the combustible element, which has attained exceptionally high prices. The quantity of coal transported by railroads and canals shows an increase of production of 4,305,617 tuns over the previous year. The increase of consumption by the metallurgic industries is but 6,073 tuns, the smallness of which is accounted for by the stricter economy practised in all establishments on account of the high prices. The exports of fuel amount to 450,505 tuns.

The Latest British War Ship, the Inflexible.

(From a paper recently read before the Institution of Naval Architects, by Nathaniel Barnaby, Esq., Chief Naval Architect of the Royal Navy.

This is the ship which the progress of invention in artillery has finally driven us to resort to. Had the manufacture of enormous ordnance been stopped when the 35 tun gun was introduced, we might have been satisfied with the Fury, with her guns of this nature, and her 14 inch armor. But English artillerists were ready to make guns of twice 35 tuns, and foreign powers were known to be building ships to receive such guns.

There could be no question that we could not allow foreign seamen to have guns afloat more powerful than any of our own, however ready we might have been to allow them to defend themselves with thicker armor. Although, therefore, it was known that the ships in which these guns were to be mounted were to be protected by 22 inches of armor, thickness of armor was not made a ruling feature of the design of the first-class ship, which was to mark the next step in advance upon the Fury—but the first of the ruling conditions was that she should be able to mount the heaviest guns which could possibly be made now, and, by some easy modification in her construction hereafter, guns of twice that weight, when they can be manufactured. The other conditions were that she should have a speed of 14 knots at the measured mile, and that she should not exceed the dimensions and cost of preceding ships. It was found to be possible, in conformity with these conditions, to protect the hull by 2 feet of armor.

I may describe the Inflexible to you briefly in the following manner: Imagine a floating castle 110 feet long and 75 wide, rising 10 feet out of the water, and having above that again two round turrets planted diagonally at its opposite corners. Imagine this castle and its turrets to be heavily plated with armor, and that each turret has within it two guns of about 80 tuns each, perhaps in the course of a few years, guns of twice 80 tuns each. Conceive these guns to be capable of firing all four together at an enemy ahead or on either beam, and in pairs towards every point of the compass. Attached to this rectangular armored castle, but completely submerged, every part being 6 feet to 7 feet under water, there is a hull of the ordinary form with a powerful ram bow, with twin screws, and a submerged rudder and helm. This compound structure is the fighting part of the ship. Seaworthiness, speed, and shapeliness would be wanting in such a structure if it had no additions to it; there is, therefore, an unarmored structure lying above the submerged ship, and connected with it, both before and abaft the armored castle; and as this structure rises 20 feet out of the water, from stem to stern, without depriving the guns of that command of the horizon already described, and as it moreover renders a flying deck unnecessary, it gets over the objections which have been raised against the low freeboard and other features in the Devastation, Thunderer, and Fury. These structures furnish also most luxurious accommodations for officers and seamen. The step in advance has, therefore, been from 14 inch armor to 24 inch; from 35 tun guns to 80 tun guns; from two guns ahead to four guns ahead; from a hight of 10 feet for working the anchors to 20 feet; and this is done without an increase of cost, and with a reduction of nearly 3 feet in draft of water.

I cannot attempt to describe the numerous novel and interesting features of such a design, but I may say that no pains have been spared to protect her against under-water attacks, by the isolation of the independent engines, the subdivision of boiler compartments, and such further subdivisions as were possible with due regard to proper facilities for moving about. The result is that the ship is perfectly and easily workable, although she is divided into 127 watertight compartments. My belief is that in the Inflexible we have reached the extreme limit in thickness of armor for sea-going ships. The temptation is always great to secure more and more power by the expenditure of ever increasing sums of money, but it is my conviction that we shall not, in any future ship, go beyond this expenditure. Some of the ironclads designed ten or twelve years ago cost more than the Inflexible will. In the Inflexible provision has been made both offensively and defensively, for an enormous increase in the powers of artillery without any increase in the cost of the ship.

Iron, published in London in the interest of the metal manufacturers, says: "American hardware and machinery are being imported largely into Germany. The handy shape, the new contrivances, and generally good workmanship, are features in their manufacture which find many friends in Germany and in Russia." This is no new fact to us, but it is the first time we have known an English journal to acknowledge it.

BLACK currant leaf tea is recommended for dyspeptics.