STENOGRAPHY BY MACHINERY.

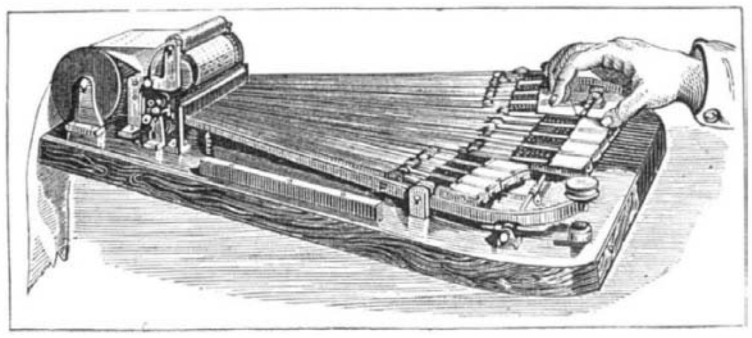
A curious apparatus has recently been invented in France, by the aid of which stenographic writing may be accomplished at the rate of from 200 to 250 words per minute, which is probably as fast as the language can be spoken by the readiest speaker. The device, an engraving of which is given herewith, consists of a keyboard operated as shown by the hand of the reporter, and composed of twelve black and an equal number of white keys. On each side of the instrument is a large key moved by a pressure of the wrist, and serving to give supplementary signs which simplify the reading of the characters printed.

All the keys, when operated, produce indications in ink on a roll of paper, which is taken from a reel in manner similar to that on the Morse telegraphic apparatus. The black keys, however, give long marks, while the white ones cause simple dots to be transcribed. At each pressure of the fingers on the keyboard, the paper is automatically unrolled for about 0·02 of an inch, so that on each line any combination of twelve double signs may be imprinted, and these signs are arranged in three groups of four each, and read from left to right in the ordinary manner.

The number of characters which may be made on each division of four is more than sufficient to to require a single movement to form a single letter. In other words, with practice, three letters or less can be written at once. If the useless letters be suppressed, such as double letters, e mute, etc., frequently a single movement will produce an entire word. In case, however, the word is to be continued to the next line, a movement of one of the wrist keys makes a character indicating the fact.

The manipulation of the keyboard requires great skill. Learning to read the characters is very easy, but at least six months' practice is necessary for one to become an expert operator capable of following every word as it is uttered in a large assembly.

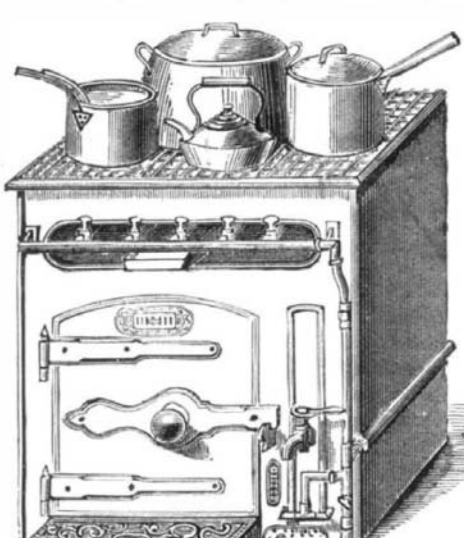
The paper roll is of no great length. About sixty or seventy feet, four inches in width, is required for an hour's continuous writing.



STENOGRAPHIC MACHINE.

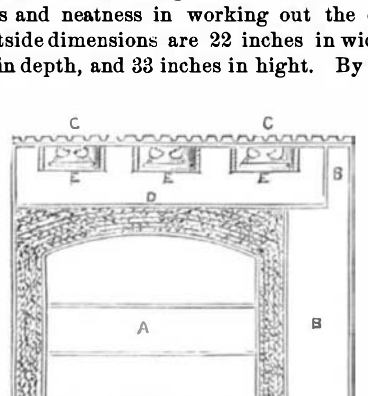
COOKING BY GAS.

We publish herewith engravings of a gas-burning cooking stove, the invention of B. Giles, Blackheath, England, who



claims to have succeeded in cooking the most delicate dishes without their imbibing the slightest flavor from the products of combustion.

Fig. 1 is an isometrical view of the small sized apparatus, in which, it will be seen, great attention has been paid to compactness and neatness in working out the design. The outside dimensions are 22 inches in width, 16 inches in depth, and 33 inches in hight. By a refe-



rence to Fig. 2 (a diagram of a transverse sectional elevation of the whole kitchener), it will be seen that the oven, marked A, is surrounded by a chamber. This chamber, marked C, is filled with coils of thin iron, except where room is left for the burners, marked F, which heat the oven and the water in the boiler, B. Over the burners, F, is a grating, marked I. This grating, which supports the coils of thin iron, is placed at a hight sufficient to allow of the gas burning to advantage for developing heat. The heated products of combustion from the burners, passing through the grating, circulate freely among the coils of thin iron, and pass out at the point, K, after the coils of iron have absorbed and utilized the greater part of the excess of temperature of the products over the atmosphere. By the adoption of this system the heat is kept uniform, and is the more equally distributed over the whole surface of the oven. The space, D, constitutes a most effective plate warmer. Over the oven gas burners, E, are placed in sets of four, for the purpose of heating digesters (for making soup), fish kettles, saucepans, etc. Each set (as with those for heating the boiler and oven) is so arranged as to thoroughly consume every particle of gas, and generate the maximum amount of heat possible. Each set of these burners for heating saucepans consumes about eight cubic feet per hour when the gas is turned full on; the heat thus evolved will raise the temperature of a gallon of water from that at which it is usually delivered to that of the boiling point of water (212° Fah.) in about thirty minutes, with a consumption of about four cubic feet of gas.

THE ALEXANDRA.

The launch of the twin screw ironclad Alexandra on April 8 adds to the British navy the finest and most powerful broadside ironclad in the world.

The principal dimensions are: Length between perpendiculars, 225 feet; breadth, extreme, 63 feet 8 inches; depth in hold, 18 feet 7⅝ inches: tunnage, 6,049; displacement, 9,492 tuns; draft forward, 26 feet; draft aft, 20 feet 6 inches; indicated horse power (intended), 8,000; speed, 14 knots.

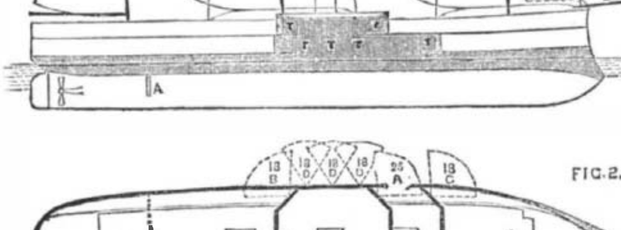
Like all her predecessors of modern type, the Alexandra has her water line protected by a belt having a maximum thickness, over the water line, amidships, of 12 inches, a thickness which, in masted ironclads, has been equaled as yet only in the French vessel Redoubtable, in the Independencia (Brazilian ironclad, whose launch was so unfortunate), built in England from Mr. Reed's designs, and in the Kaiser and Deutschland, built and building there—also from Mr. Reed's designs—for the German government. Towards the ends the belt tapers to a much less thickness, an inevitable defect of the belt system, to which it does not appear to be customary to attach much importance, though its existence is to our mind the great argument in favor of making the ends into coal tanks, which, being penetrable with absolute impunity to the ship, solves all questions of thickness of armor by enabling the designer to dispense with it altogether.

The Alexandra is a central battery ship in the best sense, that is, she needs no bow or stern batteries to give her endon fire. For the first time the English navy really has a masted ship with satisfactory all-around fire (which even the Monarch turret ship has not), for out of twelve guns the new ironclad can fire four (including the two heaviest) straight ahead, and two straight astern. On each broadside from four to six guns can be fought, according to the bearing of the enemy. The Alexandra, by virtue of her two-gun decks with end-on fire from both, thus approximates very closely, as regards range of fire, to an ideally perfect broadside ship.

Splendid ship as she is, and advantageously as she com-

FIG. 1.

FIG. 2.



THE ENGLISH IRONCLAD ALEXANDRA.

pares with other broadside ships in the English or any other navy, the Alexandra shows in places, says *Engineering*, that deficiency of protection which is always observable in vessels of her type. Thus the batteries are armored with only 8 inch and 5 inch armor—the latter a miserable defense against the guns of other ironclads. The reason of course is that the ship must, before all things, be kept above water. There is much to be armored, and not much to do it with; and when the waterline is fairly secured, the batteries are left, to say the least, very unequally protected.

It should be noted that in the Alexandra, as in previous ships built on the two-deck battery system, the upper battery serves as a conning tower, and enables that weight to be dispensed with. It will be seen by Fig. 1 that the armor forward is carried down over the ram, both to strengthen the latter, and to guard the vitals of the ship from injury by raking fire from ahead, at times when waves or pitching action might expose the bows. The magazines, engines, etc., are similarly protected against a raking fire from abaft by a hanging bulkhead, A, across the hold, plated with 5 inch armor.

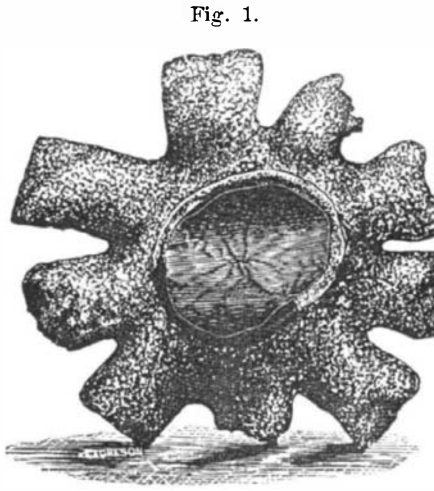
The sills of the main deck ports are 9 feet, and those of the upper deck ports more than 17 feet, above the water. The total weight of armor and backing is 2,350 tuns, and of guns and ordnance stores about 660 tuns.

The only defect of the Alexandra appears to us to be that she is too good. She is too large a version of the type. A small Alexandra, that is, an improved Audacious, would appear to us a valuable addition to the navy, well fitted for certain necessary services for the discharge of which such masted broadside ships are probably as well fitted as, or even better fitted than, masted turret ships. But if so much money was to be spent, it should have been spent upon an Inflexible, or even upon a Devastation.

BRACHIOSPONGIA.

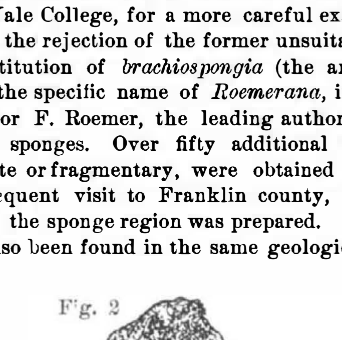
"During a geological trip in 1855, I discovered a new genus of fossil sponge, which may be worthy of a brief notice. My first specimen was exhibited to Professor L. P. Yandell, of Louisville, Ky., and while in his hands it was seen and described by Professor D. D. Owen. (Second Report of Geology of Kentucky, page 111.) He styled it an amorphozoon, and suggested the name of *scyphia digitata*. I doubt if he ever saw the fossil in place, though he correctly refers it to the birdseye group of the lower silurian. It was again described and imperfectly figured by Professor R. Owen. (Indiana Geological Survey, 1859-60. pp. 362, 363). He changed the name to *syphonia digitata*, and he recognized it as a sponge. The specimen thus described, having nine arms, I claim as my discovery, and it should be acknowledged as typical of the genus. Professor S. S. Lyon afterwards found one with eleven arms, of which casts have been

Fig. 1.



widely distributed. In 1867 I placed my original specimen in the hands of that accomplished naturalist, Professor O. C. Marsh, of Yale College, for a more careful examination. The result was the rejection of the former unsuitable names and the substitution of *brachiospongia* (the arm-bearing sponge), with the specific name of *Roemerana*, in honor of Professor F. Roemer, the leading authority on palæozoic sponges. Over fifty additional specimens, complete or fragmentary, were obtained by me on a subsequent visit to Franklin county, Ky., and a map of the sponge region was prepared. Specimens have also been found in the same geological horizon

Fig. 2



in Tennessee. Allied forms were likewise found, but they were so highly silicified and distorted as to make an accurate description impracticable. Professor Marsh's notice appeared in the *American Journal of Science and Arts* (vol. 44, p. 88), and it was afterward corrected and elaborated in the form of a paper read before the American Science Association in 1868. Fig. 1 represents *b. Roemerana*.

The general appearance of the *brachiospongia* is vasiform; a central cup, oval, with a rim one or two inches high, being surrounded by tubular arms or fingers, hollow at the base, and closed at the extremity. These arms vary in number, from five to twelve; and on this variation specific distinctions are founded. The smallest sponge of this kind thus far found is three inches in diameter, and the largest twelve inches. Frequently the fingers were found detached from the body; and in one case two large ones were found near each other, having so grotesque a resemblance to a pair of diminutive feet that for a time my assistants positively refused to aid me further!

The exterior of the *brachiospongia* is silicified, while through the interior characteristic silicious spicules are distributed. Near the center of the base, and opposite the mouth of the cup, is a small papilliform cone, which others have regarded as the point by which the sponge was attached to its support. But, in my opinion, this is a hasty conclusion; and I think it can be shown that this basal protuberance is the remnant of a partially absorbed arm. In a specimen of *b. Hoveyii* (Marsh), having twelve arms, only six of which appear in the illustration (see Fig. 2), there is evidence that the sponge arms, though constant in their specific numbers, were at intervals liable to alternate absorption and reproduction. The arm, A, seems to be the youngest in a series of which the basal cone, B, is the retiring member. A more careful study of these curious and highly interesting fossils may serve to throw light upon the mysterious laws of spongoidal growth."—*Rev. Horace C. Hovey, M. A.*

Correspondence.

The Blair Direct Process.

To the Editor of the Scientific American:

From a proof copy of the very interesting paper read on the 6th of May last before the British Iron and Steel Institute by their distinguished late President, Mr. Isaac Lowthian Bell, upon his visit to the mines and iron works of the United States in the fall of 1874, I make the following extract. Mr. Bell says, on page 47:

"My friend Mr. T. S. Blair, in company with other gentlemen, has erected a work near Pittsburgh for carrying his mode of making steel into practice. * * Mr. Blair's method consists in deoxidizing iron ore and melting the iron sponge so obtained in an open hearth with pig iron." On page 48: "Mr. Blair claims great advantages for his apparatus in saving of fuel. * The difficulty which besets this and all other modifications of dealing with iron in so fine a state of division as it exists in the sponge is its proneness to oxidation. Hitherto, it seems to me, the direct process, as it is termed, has met with the most success at Landore. The pig iron, after being melted, has blocks of ore thrown in; the carbon and silicon of the bath reduce the oxide, and the metallic iron is instantly taken up by the bath of liquid metal. Very different must be the action on sponge, which, when thrown into the furnace, will float on the melted pig, and, being exposed to carbonic acid at a very high temperature, will to some extent infallibly be re-converted into oxide. So far as I was able to learn, 2 parts of pig iron and 1 of sponge lost about 20 per cent in the furnace. Now if it be true, as I have heard it stated, that a mixture of wrought and pig iron can be fused in an open hearth with a loss of 6 per cent, it follows that a considerable portion of the sponge used in Mr. Blair's process must be re-oxidized. The specimens of steel I had the opportunity of examining indicate entire success so far as a mere question of quality in the product is concerned. There seems to be no doubt that, in obtaining the sponge iron, Mr. Blair has made a notable step in advance of M. Chenot; and I am far from wishing to be understood as expressing an unfavorable opinion on the future commercial merits of the scheme."

As one interested with Mr. Blair from the beginning in the carrying out of the mode of making iron and steel by the direct process, I would respectfully ask that you publish this communication, which seems necessary as an explanatory appendix to that portion of Mr. Bell's paper which relates to the Blair process. We had the pleasure of a long visit from Mr. Bell in October last, nearly all of his time, during his three days in Pittsburgh, having been spent with us. Our books, showing the exact amount in pounds of every component of each charge, and the resulting product in pounds of every cast of steel made by us from the beginning, were thrown open to him and were freely and fully inspected, as well by himself as by his son, Mr. Charles Bell, who assisted him in his observations. Every facility which any of ourselves enjoyed for seeing or knowing what was being done in and about every department of the works was cheerfully given him, our object (aside from showing deserved courtesy to so distinguished a stranger) being to enable him to criticize our operations with full knowledge of their details. While Mr. Bell says "so far as I was able to learn," his means of knowing the exact facts were as ample as Mr. Blair's or my own. He saw that, never at any time, even for experimental purposes, had we made a cast of "2 parts pig and 1 part sponge." In point of fact, as we never did use pig in anything approaching the above proportions, neither Mr. Bell or any of ourselves know what the loss would be.

For the week in which Mr. Bell's visit took place, the average quantity of pig metal used (in 11 casts) was $25\frac{11}{100}$ per cent of the total weight of material charged into the furnace; and the last cast inspected by Mr. Bell, and made on the Saturday, was composed of $19\frac{3}{10}$ per cent pig, $53\frac{4}{10}$ per cent sponge, $18\frac{3}{10}$ per cent scrap steel from our own steel, and 9 per cent spiegeleisen. A tabular statement was taken off from the books, which Mr. Bell took with him, of casts made from the beginning (inclusive of the time when we were battling with the difficulties incident to working a new and different melting furnace from that of Mr. Siemens, Mr. S. having at that time refused to allow us to use his furnace unless we abandoned iron sponge, which he himself was then trying to make). This statement shows that, of 691,883 lbs. of the different metals charged into the furnace, $33\frac{32}{100}$ per cent consisted of pig metal; and the amount of steel made was 589,070 lbs., showing a loss of $14\frac{86}{100}$ per cent.

The direct process at Landore, to which Mr. Bell refers, is that of Dr. C. W. Siemens. Dr. Siemens uses the ordinary open hearth furnace (not the rotator), and the steel is good enough for railway rails, and is used for that purpose, 1,000 tuns of rails per week being about the average product.

The materials consumed in making 2,240 lbs. of steel in the ingot amount to 2,961 lbs. on the average, and consist of 1,517 lbs. Bessemer pig, 197 lbs. spiegeleisen, 706 lbs. scrap steel, 541 lbs. ore (60 per cent). Mr. Bell correctly describes the operation thus: "The pig iron, after being melted, has blocks of ore thrown in. The carbon and silicon of the bath reduce the oxide, and the metallic iron is instantly taken up by the bath of liquid metal." He, however, adds: Very different must be "the action on sponge, which, when thrown into the furnace, will float on the melted pig; and, being exposed to carbonic acid at a very high temperature, will, to some extent, infallibly be re-converted into oxide."

When Mr. Bell was at our works he witnessed the fact that the iron sponge, when thrown into the furnace, did not float on the melted pig; and as it plunged and remained under the surface protected by the covering of the slag, it was not exposed to the highly heated carbonic acid, and was therefore not oxidized to an undue extent. This remarkable and interesting fact was noticed and commented on with much pleasure by Mr. Bell at that time, as it had previously been a source of satisfaction to ourselves, controverting, as it did, the theory of all and the experience of most parties.

If you will permit me, I will remark that, if Mr. Siemens would first convert his 60 per cent ore into iron sponge, and make it the principal ingredient of his charge (instead of the highly priced and more deleterious pig metal), his ingots would cost him less per tun; and instead of being useful only for rails, it would command $25 per tun more and could be used (as the Blair steel is) for all purposes, from homogeneous metal up to tool steel.

My object being, however, to make some necessary corrections of errors in the document of Mr. Bell, I ask you to give this communication the same publicity you do that paper.

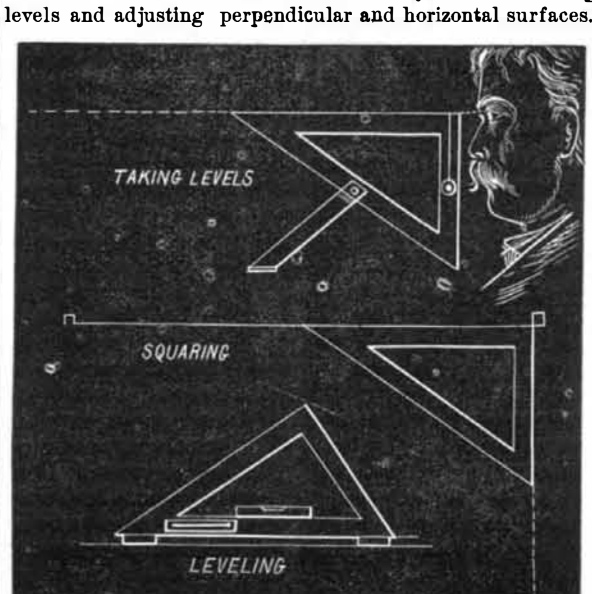
MORRISON FOSTER, Vice President.

Blair Iron and Steel Company, Pittsburgh, Pa.

A Simple Surveyor's Instrument.

To the Editor of the Scientific American:

I send you a diagram of a cheap and useful instrument, for the use of those who have ditching and leveling to do. Farmers and builders often need a ready means of taking levels and adjusting perpendicular and horizontal surfaces.



The hypothenuse of the triangle is conveniently made $7\frac{1}{2}$ inches long, the other sides being $4\frac{1}{2}$ and 6 inches, respectively. A plummet indicates the correct position of the instrument. It can readily be adapted for leveling horizontal surfaces, by adding a spirit level, as shown in the engraving.

H. C. NAYLOR.

Indianapolis, Ind.

Parasites in Wasp Stings.

To the Editor of the Scientific American:

The other day while I was dissecting a wasp, I took out his sting and found upon it a parasite. It was oval in shape. Its legs had hairs around the joints and around the feet. Its head was small compared with the body. Its *antennæ*, two in number, consisted of two joints; from the end projected two hairs as long as the other part of the antennæ. Its color was white. If among your readers there is any one who can inform me concerning this parasite, I would be very glad to hear from him.

Plainfield, N. J. W. D. M.

The Miner's Respirator.

To the Editor of the Scientific American:

As a respirator for miners, I propose a thin rubber mask, which would cover the nose and mouth, fitting so as to exclude all external gases. I further propose to have on the mask, in place of a nose, a rubber tube which would communicate with a leathern vessel, resembling in appearance a knapsack, to be strapped to the shoulders. This leather vessel should contain a mixture of the gases oxygen and nitrogen, which would be conducted to the nostrils by the tube. The mask should contain a second tube, to let the exhalation from the lungs escape; and this second tube should have a valve, so that vapors could escape, but nothing enter. In a short time, these gases would be consumed by the miner; and to remedy this, I propose to have large receivers in the vicinity of the workmen, so that the leathern vessels might be replenished with air. ANNA BLUNT.

58 East 9th street, New York city.

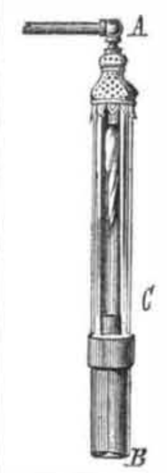
How to Take Observations at Sea during a Fog.

To the Editor of the Scientific American:

Referring to the Schiller disaster, it strikes me that observations could readily be taken from a captive balloon allowed to ascend above the strata of a dense fog. SUBSCRIBER.

NOVEL GAS APPARATUS AT THE PARIS GRAND OPERA

The magnificent opera house lately completed in Paris, probably the finest structure of its class in the world, contains a number of ingenious and novel improvements in the stage mechanism. The usual mode of illumination by gas in theaters is attended with many disadvantages and considerable danger, from the light scenery catching fire from the exposed flames. The foot lights also are a constant source of peril to ballet dancers wearing inflammable gauzy dresses, while the current of heated air which they generate is especially distressing both to vocal organs and to the eyes. The gas flames in the French opera house are so arranged that the heat is entirely conducted away, while the flames themselves are inclosed in a glass chimney so constructed that, should it break, the gas to the burner is immediately shut off. We give herewith an engraving showing the construction of the burner, in which it will be remarked that the flame burns downward. A is the supply pipe, and B a supporting tube beneath for the chimney, C. Through the tube, B, there is a blast of air driven, which draws down the flame, and, at the same time, effectually prevents the heating of the glass. Should the latter break, the end section of the tube, A, which is hinged, falls, thereby closing a valve and shutting off the supply.



The footlights thus arranged are formed in sets of twelve, and number in all one hundred and twenty. Apparatus is provided whereby any one set or all may be lifted to the level of the stage or lowered beneath.

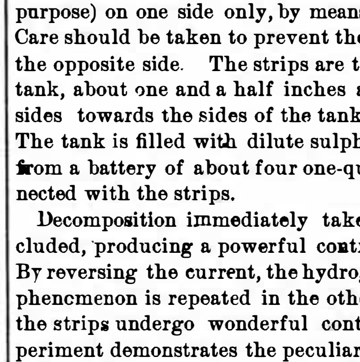
The Occlusion of Hydrogen by Palladium.

"The well known result of Graham's experiments on palladium, and the large volume of gas absorbed when thin strips of this metal are made the terminals of a rather strong current of electricity, are familiar to all. To demonstrate this fact to an audience or class has only lately been attempted, and I have devised a simple piece of apparatus, which I have used many times and have found to be correct and reliable, if the following directions are carefully carried out: Pure palladium foils, measuring about one eighth of an inch in width and three inches long, are attached to stout pieces of copper wire with hard solder; these are passed through pieces of cork cut square, according to size of tank used.

The strips are first heated in a Bunsen burner and allowed to cool. They are then coated with a thin shellac varnish (ordinary negative varnish thinned with alcohol answers the purpose) on one side only, by means of a camel's hair brush. Care should be taken to prevent the varnish from flowing on the opposite side. The strips are then placed in the lantern tank, about one and a half inches apart, with the varnished sides towards the sides of the tank and parallel to the light. The tank is filled with dilute sulphuric acid, and the wires from a battery of about four one-quart Bunsen cells are connected with the strips.

Decomposition immediately takes place; hydrogen is occluded, producing a powerful contraction in the palladium. By reversing the current, the hydrogen is discharged, and the phenomenon is repeated in the other strip. By these means the strips undergo wonderful contortions. This simple experiment demonstrates the peculiar properties of this metal."—*L. H. Laudy, in the American Chemist.*

IMPROVEMENT IN THE CONSTRUCTION OF PRISONS.



Mr. Alfred B. Mullett, late government architect, has patented an improvement in the construction of prisons, shown herewith, which consists in combining two ranges of cells, C C, with a partitioned or double corridor, G. The heating apparatus is below, and the arrows show the courses of the air, which passes through each cell, and out through the ventilators, over the corridors, as shown. The arrangement appears to be an excellent one.

ALUM and plaster of Paris, well mixed in water and used in the liquid state, forms a hard composition and is a useful cement.