dust from the heating cylinder. The carts are of sheet iron and the asphalt being a bad conductor of heat, cools very little during the transportation from the heater to the road surface.

Arriving at the place of deposit the dust is distributed and consolidated by hot and cold compressing rollers, and other tools hereafter to be described. The surface of the soil of the roadway is laid up to the proper convexity, and a layer of beton is put down, upon which the asphalt is concreted. Sometimes the entire roadway is covered with asphalt, and sometimes only a portion. Our engraving, Fig. 2, shows four different styles of roadway; A showing where the asphalt is used; B, the beton; C, the underlying soil; and D, blocks of stone like our Belgian pavement.

Before the beton is laid down, the ground is duly stamped and prepared for its reception. The whole operation should be performed only in favorable weather for reasons assigned above. The heated asphalt dust from the sheet iron carts is first spread over the surface with an iron rake or shovel, and is then stamped and partially compressed with the tools shown in Figs. 3 and 4. These tools are heated by means of a furnace shown in Fig. 5. The heating of these tools as well as that of the hot compressing roller is done, not that it is necessary to conglomerate the asphalt but to prevent the inconvenience of its adhesion to them. The material does not stick to a hot metallic surface.

The cold compressing roller used after the surface has cooled is not different from that in ordinary use in this country, and therefore need not be described. The hot compressing roller is on the contrary quite peculiar in construction. This is shown in section and plan in Fig. 6. An iron grate or basket is pivoted on the axle within the external compressing cylinder, and in this basket is carried a coal fire, the basket being so pivoted that it will hang below the axle in an upright position.

The various tools shown in Figs. 3 and 4 are adapted to smoothing the surface in different parts, and to shape the gutters along the edges of the sidewalks previous to the action of the hot compressing roller.

These details will give a fair idea of the nature of the genuine asphalt, and the method of making it into roadways.

AMERICAN ROADS.

So far as we are aware, no deposits of similar material have been found in America. The attempts to use asphalt have been confined to material imported for the purpose. Most, if not all, of the various forms of concrete made with coal-tar and pine-tar, mixed with gravel, coal ashes, etc., have proved incapable of withstanding the effects of frosts or of heavy travel.

Should the asphalt prove to answer the purpose, there seems no reason why an artificial asphalt might not be made which would answer the same purpose. Whether the bitumen found in the Seyssel asphalt is of such peculiar adhesiveness that no other substance can be found to equal it in this respect, we cannot say, but it appears to us that its peculiarities arise more from the way the carbonate of lime and the bitumen are naturally mixed than from any chemical peculiarity. If this supposition be correct, it would seem possible to produce an artificial asphalt rock, as good as the natural deposit. The natural indication seems to point directly to a composition of carbonate of lime and bitumen, for road surfaces. Immense quantities of bitumen exist and can be obtained at a very cheap rate. An almost inexhaustible supply of it is found in the pitch lake of Trinidad and it is of very adhesive quality. Should the adaptability of asphalt to American roads be demonstrated, it would seem that some experiments with an artificial material of a similar nature might be a promising venture.

[For the Scientific American.]
NEW PAINT.

BY G. WIDEMANN.

By adding to a solution of chloride of zinc some white oxide of zinc in powder, a cement is obtained, known as "Lallement's Cement," which is used for stone and metals, and is also frequently employed by dentists for filling decayed teeth, on account of the oxy-chloride of zinc thus obtained which is insoluble, white, and very hard; it is also used in modeling objects of art of a very fragile nature.

For painting purposes the oil and essence generally used can be replaced by an aqueous solution of chloride of zinc to which tartrate of potassa has been added.

In order to give body to this mixture a certain amount of potato starch is added; in submitting this mixture to heat, the starch is dissolved, and in cooling it gives the required consistency.

Having added to the powdered oxide of zinc, the mineral or vegetable colors (also powdered) which it is intended to use, the oxide of zinc thus colored is mixed with the aqueous solution of chloride of zinc, and the whole applied by means of a brush on the surface to be coated. The mixture soon dries after its application on account of the production of oxy-chloride of zinc, the whole will dry perfectly in half an hour.

The alkaline tartrate added has for its object to delay this drying, which without it would be too sudden.

To obtain white paint the above mixture may be employed without the addition of any coloring matter, as the oxy-chloride of zinc gives a very fine white color.

The advantages of this paint are the following:

First. They are more durable than oil paints, and do not blacken by exposure to sulphurous vapors.

Second. Devoid of any odor, and drying quickly, one coating can be applied in winter every two hours, and every hour in summer; so that a room can be completed in a day's work.

Third. Resisting dampness, and the action of water (even boiling), it can be cleansed with soap, as is ordinary oil paint.

Fourth. This paint containing the chloride of zinc is antiseptic, and preserves wood against decay.

Fifth. It diminishes the combustibility of the substance to which it is applied, as chlorine renders hydrogen incombustible in combining with the latter to form hydrochloric acid, which cannot be decomposed by heat. A certain quantity of borax may also if desired be added to the solution so as to increase its incombustibility.

Sixth. It is manufactured without danger to the health of the workmen.

Seventh. The oxide and the chloride of zinc are found in the trade at a low price, and these substances can be kept without alteration any length of time, in any climate.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

State of Steam over the Water Level in Steam Boilers.

MESSRS. EDITORS:—In my last the exceeding rapidity of water circulation in a good boiler was noted.

I will here speak of the actual state of things as I found them above the water level of the same boiler. By the use of a great number of small try cocks along the side, I found what I shall call a wave of spray, composed of tiny drops lifted mechanically by the rapid upward current of steam just over the greatest heat; ever varying in density and shape, ever doing its quiet and useful work of separating the new made steam from its accompanying water. This wave had an outline something like the accompanying sketch.

As I am not writing for any boiler but only seeking truth, I give nothing of outline but simple interior, showing the unstable wave of spray covered by a layer of damp fog or very cloudy steam, the whole rising from 8 to 10 inches at the highest part. I noted particularly that this never moved forward near enough to the try cocks in front of the boiler to be detected by them, but kept hovering over the hottest part of the boiler.

After finding this to be the case, I very unwisely tried to get dry steam from the back end of a long boiler, which was making nearly all its steam over the fire at the front. I failed to get dry steam, although I had really more steam room than in the first experiment which had yielded such good results; but searching as before for the truth, I found my poor wave of spray on a terrible bender—demoralized to the last degree, distorted, broken and mixed, rolling, tumbling over the surface, swept before the current of steam made at the front with no exit but at the back. There was the trouble—what had I been thinking of?

My remedy was clearly pointed out, and quickly made and tested. I simply put the same number of cubic feet of steam space over the steam produced, imitating the outlines nature had given me as near as I could. All was right. My wave of spray went soberly to work under its tent-shaped steam room. It gave me dry steam once more at a rapid rate, and so has been doing ever since.

Olney, Ill.

T. L. L.

Spontaneous Combustion of the Human Body.

MESSRS. EDITORS:—In a recent number of the SCIENTIFIC AMERICAN it is stated that Mr. A. B. Flowers, of Alexander, La., considers that he has found a "mistake" in the article on this subject reprinted some weeks ago from the *Boston Journal of Chemistry*. If he will take the trouble to look at the article again, he will see that the statement that "no one has ever witnessed a case of such spontaneous combustion" is given as one of the points in which the fifty cases investigated by Liebig agree, according to the account of that eminent chemist. The writer of the article makes no assertion of the kind on his own responsibility.

We wish that Mr. Flowers would give a more detailed account of the case mentioned by him. We should not infer from the paragraph in the paper that the body was consumed or even burned at all. The breath from the mouth and nostrils appears to have contained so much alcoholic vapor that it took fire, and death was the result. Was it an open fire near which the person was sitting? And is it not possible that the vapor took fire in much the same way as naphtha vapor might under similar circumstances?

If the body could be burned up in the manner described by the old writers on spontaneous combustion, it would seem that it ought to have happened in this case. These authorities (?) state that the flame cannot be extinguished by any ordinary means—and this assertion may be found in so recent a book as "Steele's Fourteen Weeks in Chemistry," published for educational use in the year of grace 1867!—and that the body may be burned to ashes without even scorching the clothes. How was the fire put out in this case? or did it go out of itself, and, if so, how soon? Has any full description of the case been published in any medical or scientific periodical? If not, it is very desirable that either Mr. Flowers, or some other of the eye-witnesses should prepare such a description at once.

The last alleged case of spontaneous combustion of the

body, reported in full and carefully examined by competent medical men, was that of the Countess of Goerlitz, June 12, 1847. In that instance the Hesse Medical College, after due investigation, reported that the person had not died from spontaneous combustion. The case was then referred to Liebig and Bischoff, whose report was to the same effect. It subsequently appeared from the confession of the man who committed the murder, that the Countess had been strangled and the body wilfully burned after death.

Much interesting matter on this subject may be found in Dupuytren's "*Leçons Orales*" and in Taylor's "*Principles and Practice of Medical Jurisprudence*."

Leclanche's Battery.

MESSRS. EDITORS:—I see in the last number of the SCIENTIFIC AMERICAN, that you desire some information on Leclanche's battery. Starting on very judicious considerations, M. Leclanche has devised a single liquid battery, and obtains a constant current by an arrangement unknown before; all the batteries giving constant currents being hitherto employing two liquids.

In every battery, the body receiving the positive electricity must be inoxidizable, a good conductor, and possess such affinity for hydrogen that the latter is seized as soon as produced, and thus the perturbations caused by the presence of free hydrogen are prevented.

The peroxide of manganese possesses all these qualities in the highest degree, being inoxidizable, insoluble, and possessing great electric conductivity and affinity for combustible bodies. It therefore constitutes a very good positive element.

As a negative body, M. Leclanche retains the zinc, which possesses all the requisite properties for the purpose. As for the liquid coming in contact with the two poles, the hydrochlorate of ammonia, or the commercial sal ammoniac, has received M. Leclanche's preference.

Practically, for the sheet of peroxide of manganese, M. Leclanche has substituted crushed peroxide, kept in a porous jar; the positive electricity of this mass is collected by means of a plate of gas carbon. It is necessary to use a very pure peroxide. A good conductor, the best known for this purpose, is known in the market under the name of *manganese aiguilli*. It is crystallized, silky, and possesses a very pronounced graphitoid luster. If it joins to these qualities that of being hard, it is then the best conductor. To use this peroxide first separate it from the *gangue*. Then crush the mass into coarse grains. It is then passed over a metallic wire cloth to separate the dust; an equal quantity of crushed gas carbon is added, and you have thus the best conducting body.

As for the solution of sal ammoniac, it is better to use it always at the highest degree of concentration. By adding to the liquid an excess of this salt, it gradually dissolves and keeps up the strength of the solution. Care must be taken that this solution does not wet the porous jar higher than the middle, as the drier the mass contained in the porous jar is kept, the better are the conditions of conductivity and working.

This battery possesses a considerable electromotive power. This power is represented by 1.382, the power of the sulphate of copper battery being taken for unity. Its resistance is relatively very weak, a very advantageous circumstance for telegraphing.

Experience has proved that 28 elements of Leclanche's are amply equivalent to 40 of Daniell's. The Leclanche battery, put in comparison with the Marie, Davy, or the sulphate of mercury battery, much used latterly on telegraph lines, is preferred as it requires less care; the sulphate of mercury being also more expensive.

The cost of the sulphate of mercury in France is from 3 to 3½ francs per kilogramme, or 2 pounds 4 ounces supposing all the residues collected and resold without loss; but as this is practically impossible, the cost is 7 francs per kilogramme. The kilogramme of manganese costs from 16 to 17 cents.

An element of Leclanche, remaining a year without working, will lose nothing except by the oxidation of the zinc in the atmosphere, and this is so insignificant it does not amount to one per cent. It is always ready to be set at work, and will last in a telegraph service from one to three years.

Over 20,000 elements of Leclanche are actually in use by different railroad companies in France and Belgium, and numerous telegraph stations have been working with perfect regularity for two years without the least interruption. It is principally used in France, Belgium, Holland, Austria, and Italy.

In France the *Chemin de fer de l'Est* has adopted it, and the *Compagnie de l'Ouest* employs it with the apparatus of Tiers. It is also used in a great number of establishments for galvanoplasty, gilding, and silverplating, and at Brussels (Belgium), it regulates all the electric clocks.

C. WIDEMANN.

Firing under Steam Boilers.

MESSRS. EDITORS:—The article from *The Engineer* on repaired boilers, in a late number of your journal, is so deeply interesting to me that I am strongly impressed to respond to it. I am well acquainted with the iron works referred to; and from my own knowledge I beg leave to speak in reference to their method of firing, as some of those boilers were known to me. They are fired at one end with slack of bituminous coal, fire space very large; and when the fire becomes incandescent great heat is evolved. The slack is generally thrown on while the fire is clear and in good condition, so as to more readily ignite it. But, to do this, it seems to be necessary to open the fire doors, which are generally large. Then what must be the effect of all the cold air that rushes in, while more slack is being thrown in? When once in, the