Another potentate of ebony hue ordered a number of polished ship bells in elegant brass frames, and mounted on mahogany stands, engraved with the assumed name of the sable prince, "Yellow Duke, Esq." The number of workpeople directly engaged in this branch of Birmingham industry, is estimated at about two hundred and fifty, and the increasing use of bells, both for outdoor and indoor purposes, promises to augment the number at no distant date.—*Mechanics' Magazine.*

A NEW STONE.

Architects have for some years past been indebted to Mr. Frederick Ransome for providing them with a constructive material of very great value, a stone which can be molded into any form, which can be produced in blocks of any size, and which, when made, is as durable as the best kind of natural stone known. The production of this material—the "patent concrete stone" as it is termed by Mr. Ransome—was the result of many years of persevering labor and struggles against difficulties; but we now find that Mr. Ransome, not content with what he had already accomplished, has succeeded in producing another new stone, which is in many respects as superior to its predecessor as the latter was to all other artificial stones produced before or since.

Before describing the process by which this new stone is made, it may be desirable that we should recall to the minds of our readers the method of manufacturing the artificial stone generally known by Mr. Ransome's name, as this will enable us to speak of the steps which led to the production of the new material. The ordinary "Ransome stone," then, is composed of particles of sand, mixed, in some cases, with a little ground carbonate of lime, the whole being incorporated into a solid mass by the formation in the interstices of a silicate of lime. After many fruitless searches after a method of procuring silicate of soda on a commercial scale, and at a moderate cost, Mr. Ransome hit upon the plan of boiling flints in a solution of caustic soda *under steam pressure*, and it is the silicate of soda thus obtained that Mr. Ransome employs to bring the materials we have mentioned into a plastic state, in which they can be molded to any desired form. This being done, the block produced is treated with a solution of chloride of calcium, when a double decomposition takes place, the silicic acid and the oxygen of the silicate of soda combining with the calcium of the chloride of calcium, and thus forming silicate of lime, while the sodium unites with the chlorine of the chloride of calcium, thus forming chloride of sodium. The silicate of lime produced in this way unites the particles of sand, etc., into a hard and perfectly durable mass, while the chloride of calcium remains diffused throughout the block, and has to be removed by washing.

Now, regarded from a manufacturing point of view, this washing process is rather a nuisance, particularly where large blocks are being made. If performed thoroughly, it occupies very considerable time, and, consequently, delays the turning out of the work; while, if not performed properly, there eventually takes place a greater or less efflorescence of the chloride of sodium, which, although not affecting the strength or durability of the stone, spoils its appearance. Under these circumstances, Mr. Ransome was led to endeavor to so modify his process as to render this final washing unnecessary, or, at all events, to reduce its amount, and, step by step, he arrived at the new method of manufacture, which we shall now describe. In carrying out these new plans, Mr. Ransome makes a mixture of certain proportions of ordinary sand, Portland cement, ground carbonate of lime, and some silica, readily soluble in caustic soda at ordinary temperatures, such, for instance, as the stone found in the neighborhood of Farnham and other places, and these materials he makes into a plastic mass by the addition of the silicate of soda already mentioned. The mass thus formed remains plastic a sufficient length of time to allow of its being rammed readily into molds of any desired form; but it gradually hardens, and ultimately becomes thoroughly indurated, and converted without any further treatment, into a hard stone, capable of resisting heat and cold, perfectly impermeable to moisture, and which, as far as can be judged from the experience hitherto obtained, goes on increasing in hardness, and bids fair to be thoroughly durable.

The chemical actions by which this wonderful result is produced are very curious, and Mr. Ransome's explanation of them is as follows: The Portland cement consists, as is well known, of silicate of alumina and lime; and when the materials are mixed up with the silicate of soda, the latter is decomposed, the silicic acid combining with the lime of the Portland cement, and forming silicate of lime and alumina, while caustic soda is set free. This caustic soda, however, immediately seizes upon the soluble silica, which constitutes one of the ingredients, and thus forms a fresh supply of silicate of soda, which is in its turn decomposed by a further quantity of the lime in the Portland cement, and so on. If each decomposition of silicate of soda resulted in the setting free of the whole of the caustic soda, the processes we have mentioned would go on as long as there was any soluble silica present with which the caustic soda could combine, or until there ceased to be any uncombined lime to decompose the silicate of soda produced, the termination of the action being marked by the presence in the pores of the stone of the excess of caustic soda in the one case, or of silicate of soda in the other. In reality, however, the whole of the caustic soda does not appear to be set free each time the silicate of soda is decomposed by the lime, there appearing to be formed a compound silicate of lime and soda, a small portion of the latter being fixed at each decomposition. The result thus is that the caustic soda is gradually all fixed, and none remains to be removed by washing or other process.

By his new process Mr. Ransome is enabled to produce admirable artificial marbles, while, by introducing amongst the materials fragments of quartz and a small proportion of oxide of iron, he obtains a stone of rich color, and hardly distinguishable from Peterhead granite. Like the natural granites and marbles, the artificial substitutes are capable of taking an excellent polish, while they possess the great advantage over the natural products of being capable of being molded in the course of manufacture into any form at a trifling cost. It would be idle for us to attempt here to enumerate the uses to which the new stone can be applied, for they are practically numberless. For decorative purposes it will be invaluable, and Mr. Ransome deserves the best thanks of architects, and we may add, of engineers, also, for having furnished them with a new constructive material at once so cheap and good.—*Engineering.*

Boiler Explosions.

The explosion of a steam boiler is *primâ facie* evidence of carelessness in its construction, or in its maintenance, or in its use. It is so regarded by the engineers, and ought so to be regarded by the law. It will be easy to convince any one who will examine the records of boiler explosions and inquire into the means of preventing them, that no injustice would be done to the owners of boilers by indicting them for criminal carelessness in all cases of explosion.

The history of boiler explosions is authentic and definite. The boiler has usually been erected under the full light of modern science. All the attending circumstances of the explosion have been immediately communicated to the public; curiosity has aided science in making every man an investigator of these circumstances and a searcher after causes; public and private commissions have been appointed to examine the subject generally; numerous legal tribunals have gone to the bottom of special cases, and innumerable private professional observers have witnessed results, searched records, weighed evidence, and arrived at general conclusions. All the plausible theories of explosions have been not only looked into, but worked out, in many cases, experimentally or theoretically, to their ultimate limits.

Now the remarkable and unprecedented result of all this investigation is, not the division of any large body of experts into schools; not the building up of rival theories, but the universal conviction of all concerned, that boiler explosions are certainly in most, and probably in all cases, the result of malconstruction or maltreatment, and of nothing else, and that the usual immediate cause is the unchecked deterioration of the boiler in service. In the great majority of cases the evidences of carelessness are as plain as the time of day on the face of a clock—a sheet furrowed nearly through; a stay bolt rusted off; a crown-sheet insufficiently supported; expansion and contraction unprovided for; water connections stopped up; bad material—some one of the many obvious and certain conditions of rupture. In a few cases the immediate causes are not apparent, and then the electricity theorists, and the gas people, and the mystery men fight over the remains in the newspapers; and the only reason why simple neglect is not discovered to be the cause, is that the parts of the boiler which would otherwise reveal it, are blown away, or are too much mutilated or obstructed to be legible. Simple bad treatment by the maker or user will account for the original rupture which ends in any explosion, however terrific may be its effects. There is force enough restrained within every steam boiler running today to perform the most terrible work of ruin that any similar boiler ever performed in exploding. When this force is once released, the amount of destruction depends on the point of rupture, the resistance, the surroundings, and on an infinite number of circumstances, mostly outside of our control. The only thing we can do, and it is enough, is to keep the resistance superior to the normal pressure.

Now that the causes of boiler explosions are so well understood as to be a matter of commercial calculation—where companies make money by insuring such boilers as are constructed and maintained according to established professional rules—it is to be regretted that the Government should stand helplessly by, and see scores of people scalded to death every few weeks, for the want of an adequate law and a system of inspection. Boiler insurance and inspection companies—and they are no new or experimental thing—simply prove that boilers constructed and maintained according to certain well known rules, are practically safe; that the chances of explosion, even with ordinary water-tending, are very remote, and they stake their money on this knowledge; and yet the United States Government has been unable to even check the increase of these disasters. If Congress cannot at once provide for the security of the public against boiler explosions, it had better let out the job of protecting its citizens to some insurance company, and then it will be done on scientific principles, and by competent men.—*N. Y. Times.*

The Domestic Silk Trade.

The interruption to the Lyons silk manufactories, naturally resulting from the Franco-Prussian war, has proved, according to the *Chicago Bureau*, of very material benefit to the producers of silk fabrics in this country. The sales of the principal makes of American silks have, we are informed, increased fully 100 per cent since the outbreak of the foreign war. Our manufacturers were competing successfully with foreigners in the production of colored silks, while the trade, though taking all the black goods manufactured here, manifested a decided preference for those of foreign make. The war has had the effect of increasing the demand for both black and colored domestic silks, though this is more noticeable in the former. Another result of the foreign disturbances—a result equally gratifying and unexpected—is the decline in the price of American goods. It seemed natural to believe, at the beginning of the war, that the inevitable result would be an advance in prices, consequent upon the increased demand and in sympathy with a rise in foreign goods. This, however, has not been the fact. Our manufacturers, like their Lyons competitors, always depended chiefly upon Italy and France for their raw silk, the California production not having become sufficiently well developed to furnish a supply anything like adequate to their demands. Now that the Lyons manufacturers are forced, by reason of the war, to suspend operations to a great extent, the Italian and French growers, especially the former, are looking to America for buyers of their staple, and finding our dealers ready to buy for cash, their desire to realize quickly induces them to make liberal concessions from current prices, which are, in fact, no higher than before the war. To this we owe—what must have been remarked by every silk buyer—the fact that American silks are now selling at lower prices than when brought into more active competition with the products of the principal silk-manufacturing districts of the world.

Extract from the Diary of Isambard Kingdom Brunel, in 1835.

53 Parliament street, Dec. 30.

What a blank in my journal (the last entry is dated January, 1834), and during the most eventful part of my life! When last I wrote in this book I was just emerging from obscurity. I had been toiling most unprofitably at numerous things: unprofitably, at least, at the moment. The railway was certainly being thought of, but still being uncertain. What a change! The railway is now in progress. I am the engineer to the finest work in England. A handsome salary, on excellent terms with my directors, and all going smoothly. But what a fight we have had, and how near defeat, and what a ruinous defeat it would have been! It is like looking back upon a fearful pass; but we have succeeded.

And it is not this alone, but everything I have been engaged in has been successful. Clifton Bridge, my first child, my darling, is actually going on; recommenced work last Monday—glorious!! [Here follows a list of the undertakings in which he was then engaged.] I think this forms a pretty list of real sound professional work, unsought for on my part, that is, given to me fairly by the respective parties—all, except the Wear Docks, resulting from the Clifton Bridge, which I fought hard for, and gained only by persevering struggles. . . . And this at the age of twenty-nine. I really can hardly believe it when I think of it. I am just leaving 53 Parliament street, where I may say I have just made my fortune, or rather the foundation of it, and I have taken 18 Duke street.

Remarkable Cave in Thomas County, Georgia.

We find the following interesting account in the Thomasville *Enterprise:*

Near the line of Brooks and Thomas counties, there has long been known an opening or cave in the earth, called "Devil's Hopper." Many persons residing in the neighborhood had visited it, but not one of these attempted a real exploration. We have before us, however, a letter written two months ago by a young gentleman in this city, to his father, describing an exploration of this cave by himself and a physician friend of his, residing in Boston. The writer says it was the most beautiful place he ever saw in his life, and he would not have missed seeing it on any account. He says that, after creeping through a narrow entrance at the surface, they descended to the depth of two hundred feet, winding about in the narrow path walled with solid flint rock, until they came to a well, which they descended by means of a rope, and found it to be forty-five feet deep, without water. At the bottom of this well they found the narrow passage leading off from the first, in a tortuous course, still walled with flint rock; they continued to follow it, and at some distance from the wall entered a large room or hall, walled with the same impenetrable flint rock, but jagged and pointed in a thousand fantastic shapes. The writer declares his inability to describe the grandeur and beauty of this hall by torchlight, but says he found himself in a large room walled with flint rock so jagged that a fall against it would cut one to pieces, and beautifully hung with stalactites that reflected the light in a thousand forms and sparkled with diamond brilliancy in the nooks and corners of the hall.

Manufacture of Glycerin in Cincinnati.

In Cincinnati, two million hogs are annually slaughtered for pork, bacon, and lard. The average weight of the heavier animals is 400 pounds. In former years, the chief attention was bestowed upon the manufacture of stearin candles and soap grease, in addition to salting and smoking meats, but latterly, since the demand for glycerin has called it into notice, more attention has been given to its preservation. For this purpose the lard is treated with water at 662° to 720° Fah., by which the glycerin is separated from the fatty acids, and freed from the disagreeable odor that characterizes glycerin made in the process of soap manufacture. Two or three large establishments manufacture annually 500,000 pounds, valued at $200,000 for the crude article. As there is an average of one hog to each individual in the United States (nothing personal intended), the forty million porkers can supply us with all the glycerin we are likely to want for an unlimited amount of artificial champagne, doctored cider, and rectified beer, not to speak of sirups and candy.

The Public Printing Office, in Washington, is to be connected with the Capitol, by telegraph, and a pneumatic tube is talked of for carrying messages, proofs, etc.