The sand, a clean-grained, slightly brownish sort, just such as a dishonest grocer might select for increasing the gravity specific or otherwise, of his sugar, comes from near Maidstone. There is no end to the quantity of it, and we believe it costs less than 3s a tun in the Thames. There are flints, enough for a hundred years to come, brought up from the chalk pits at Charlton; and the caustic soda and the chlorine of calcium, the latter a waste product of the soda manufacture, are bought of the wholesale chemists. The silicate of soda is made from the flints and caustic soda as follows: The flints are heaped upon iron gratings within a series of cylindrical digesters, of the material, size, and form, of small steam boilers A solution of caustic soda is then added; the digester is then closed steam tight, and the contents are boiled by steam of 70 lb., taken from a neighboring boiler, and led through the solution in a coil of iron pipes. The solution of caustic soda is prepared of a specific gravity of about 1,200.° The flints are dissolved into "soluble glass," and are drawn off in that state, as a clear though imperfectly liquid substance, which is afterward evaporated to a treacly consistency and color, and of a specific gravity of 1,700.°

The sand is completely dried, at the rate of two tuns an hour, within a revolving cylinder, through which hot air is forced by a centrifugal fan. A small portion of finely ground carbonate of lime, say Kentish rag, or even chalk, is mixed with the sand, the more closely to fill the interstices; and each bushel of the mixture is then worked up in a loam mill, along with a gallon of the silicate of soda. Thoroughly mixed with this substance, the sand has a sticky coherence, sufficient to enable it to be molded to any form, and, when well rammed, to retain its shape, if very carefully handled. In this condition—molded, of course, and any thing that can be done in founder's loam may be done in this sand, sticky with silicate of soda—in this condition it is ready for the solution of chloride of calcium. The instant this is poured upon the molded sand, induration commences. In a minute or so, we hardened little lumps of sand, so slightly stuck together by the silicate of soda that we could hardly keep them from falling to pieces within the fingers, into pebbles so hard that they might be thrown against a wall without breaking, and only a short further saturation was necessary to indurate them throughout. In other words, on the instant of contact, the silicate of soda and the chloride of calcium mutually decompose each other, and reunite as silicate of lime and chloride of sodium, the former practically indestructible in air, the latter, common salt, perfectly deliquescent and removable by washing, although the stone, after the washing, is impermeable to water. Plaster of paris does not set quicker than silicate of soda and chloride of calcium.

The chloric solution is first ladled upon the molded sand, and, the hardening going on, the objects are afterward immersed in the solution itself, wherein large pieces are left for several hours, the solution being boiled in the open tanks by steam led through it in pipes. This expels any air which may have lodged in the stone, and possibly hightens the energy of union with the silicate.

After this the stone is placed, for a longer or shorter time, according to the size of the object, under a shower bath of cold water. This is not, by bathing, to convert it into Bath stone, although were the Bath stone a sandstone, instead of an oolitic formation, this name would do as well as any. The salt, or chloride of sodium, deposited throughout the interstices, is sought out and washed away, in brine, by the water, and were it not that a portion of undecomposed chloride of calcium was also washed out, this brine might be profitably evaporated for common salt. Now this searching out of the salt by the water would appear to prove that the stone was perfectly permeable, but, by one of those paradoxes with which chemistry abounds, the stone, when once freed from salt, is almost impermeable. The action is one which, if it can be explained at all, can only be explained as one of the phenomena of dialysis, as experimentally investigated by Professor Graham. There is no doubt whatever that salt has been deposited everywhere throughout the stone, no doubt that it is afterward completely washed out, and yet the stone as effectually resists the passage of water afterward as if it were granite or marble.

It is not necessary to describe the variety of objects that may be made in the new stone. It is practically a fictile manufacture, although not indurated by fire, and, unlike fictile goods, having no shrinkage or alteration of color in the making. Whatever the required size of the finished stone it is molded exactly to that size, with no allowance as in molding fire clay goods or in pattern making for castings in iron, The heaviest blocks for works of stability, and the most elaborately ornamented capitals, tracery, or copies of statuary may be made with almost equal facility. For any purpose for which natural stone has ever been used for construction or architectural ornament, the artificial stone will fitly take its place. Mr. Fowler has used it extensively in the stations of the Metropolitan Railway; Messrs. Lucas Brothers have used it with success in various works; several manufacturers at Ipswich and elsewhere have the bed stones of their steam engines, steam hammers, oil mills, etc., formed of the new stone. Mr. Ransome has molded a large number of Ionic capitals for the New Zealand post office, and still more richly embellished capitals, modeled from those of the Erectheum at Athens, for public buildings at Calcutta, beside a great amount of decorative work for English architects.—*Engineering.*

Novel Lifeboat.

There is now in process of construction at the yard of G. W. Alexander, in Philadelphia, a lifeboat of the ordinary form with detaching apparatus, and a peculiarity which was wanting in all the boats exhibited before the Commissioners. However successful each of them promised to be in keeping afloat in the most troubled sea, not one of them in any way insured its passengers from being washed away or submerged by a sea breaking on or over. This last desideratum, and not the least important one, this novel invention claims to supply. The boat proper is arched over by a light metal skeleton ribwork stretching from gunwale to gunwale, and there secured. Upon this frame work is extended a double covering composed of canvas and india-rubber, firmly secured to the boat. The double covering is capable of inflation, and thus renders the entire structure extremely buoyant. An opening in the cover, three feet by four, admits the passengers. This opening is around the mast, and by a peculiar arrangement can be hermetically closed when passengers and crew have entered. The mast, which is of metal and hollow, is used as a ventilator, and in conjunction with a small fan of simple construction and easy operation, serves as the means of producing two currents of air—one of foul air generated in the boat when tenanted, and another of pure air to take its place.

It is claimed for this boat that when completed, it can be prepared for launching as rapidly as any other; that owing to its not careening when weighed upon on either side, passengers will enter with safety; that it is certain to fall with its load as it ought to do from the davits, and that when on the sea, however tempestuous, it will be impossible to swamp it, being water-proof above and below. It is to be propelled by oars, passed out through apertures, so constructed as to admit of no leakage, and an arrangement in the cover permits a look-out to the steersman. This novel boat, in which, if practice will bear out theory, passengers can be rescued from shipwreck and sustained through the worst weather for many days, will undergo a test down the bay in a short time, where a severe trial will be made of the peculiar and valuable qualities she claims to possess exclusively.

For the Scientific American.

FLINT GLASS MANUFACTURE.

Knowing the deep interest you take in the manufacturing business and the working classes in general and with what readiness you receive in your columns anything tending to ameliorate their position, I would submit to you a few remarks on an important branch of our national manufacture viz. flint glass.

Recently I had occasion to consult a document showing the amount of trade carried on by France with Chili and Brazil. I was struck with the large quaniity of glass that country sends to our neighbors. Why should it be so? Is it the fault of our merchants or our manufacturers? The fault is more particularly with our manufacturers and we will try to prove our assertion in the following lines:

Let us see first what resources we possess. We have sand in abundance and of the first quality such as the Berkshire in Massachusetts and St. Genevieve in Missouri. Sand is also found in Virginia fully equal to the Berkshire, in South Carolina, Georgia, Alabama etc.

As to fire clay, besides the superior quality found in Cheltenham in Missouri, it is found in Kentucky, Virginia, South Carolina and Georgia, awaiting skillful hands to make it useful, when manufacturers will get so far over their prejudices as to give it a fair trial. Potashis at our door and lead is found in abundance in Missouri, Illinois, Iowa, etc. Wood and coal is plenty in several localities.

It will be noticed from the foregoing lines that Missouri is one of the states offering the most advantages for flint glass manufacturing, containing every material needed and in sufficient quantity to furnish glass to the United States, for centuries to come.

France has but little or no lead, it is brought from Spain and England: Potash is sent from this country: Sand is scarce and of inferior quality compared with that found in this country: Fire clay is dear as well as coal and wood.

What is there wanting to enable manufacturers here to compete with the French in supplying markets at our door? If we consult manufacturers they will say that labor is much higher here than in Europe; this is true, but nature has given us advantages that more than offset this difference.

The fault in our opinion is to be found somewhere else. First our wares are as a general thing too heavy and clumsy: moreover they are not in accordance with the taste of other countries, such as Brazil, Chili etc., where light and tasty wares richly cut are better appreciated. Our wares necessitate a large quantity of glass, fully double of what would be required in France for the same purpose. It is established here beyond a doubt that French manufacturers have kept their superiority in this style of wares, and know how to take advantage of it by having styles adapted to the taste and uses of different countries. Why should not our manufacturers do the same? Workmen here are not inferior to those of Europe, they are only waiting for the proper hands to guide them to obtain the same result, and moreover our heavy clumsy wares are an imposition and a tax on our consumers who have to pay for a large quantity of materials of no use to them whatever, this however yielded no larger profit to manufacturer. What can we do but grieve and bear it when we have no choice and a prohibitory tariff is now in force to protect a branch of manufacture in existence in this country for a number of years. In consequence, manufacturers are nearly entirely indifferent in adopting means to improve their business.

The principal fault is in the management: our want of system and control in order to remedy abuses, and in a word, in a wrong application of the productive forces.

In France the management is always entrusted to the hands of a superintendent capable of managing every branch of the factory, and under his immediate orders are placed the subaltern employes. It is indispensible for him to know every particular in manufacturing, from the buying of the materials up to the sale of the wares. It is evident that no one better than himself is able to establish cost prices. It is well to note here that the cost price of an article is of more importance than the price of sale, as competition can only be overcome by reducing the former. Cost price therefore, is the thermometer of the manufacturer; it shows him whether he is able to maintain competition, shows him the reasonable limit to which it ought to go; it is by its agency that an approaching failure in business is foretold.

French workmen in glass manufactories are paid as follows.—They have stated wages, varying according to the intellectual capacity and skill of each, but the cost price, of each article is ascertained before hand from an average taken of the quantity made by each set of hands, and if subsequently the amount of work performed exceeds in value the amount of wages paid, the amount of this excess is distributed among each set of hands according to a certain pro rata, in the shape of extra compensation, thus stimulating the workmen to do their best for their own interest and that of their employer; for this reason they would not suffer the management to remain in the hands of incompetent parties who would be impediments in the way of their interest. Glass blowers moreover, are well paid and well thought of in France. Besides their ample pecuniary remuneration they are certain to possess the esteem of their managers who can appreciate their capacity. This is one of the surest stimulants to increased production.

Flint-glass manufacturies excepting a few in this country, are generally managed as follows. Often times the manager of the factory is an individual who is completely ignorant of the first principles of the business, he therefore delegates his power to a foreman who may be better acquainted with intrigue than with the practical knowledge required of him, he is therefore at the mercy of his hands. At other times it may be an ex-blower who, though he may be an excellent workman, from the want of a general knowledge of the business, fails. In either case it follows that each hand is a sort of manager from the pot maker to the man at the grates, each of whom is supposed to have a deliberative voice in the management of the establishment. In such a state of things a consciencious and skillfull workman becomes indifferent and disgusted. It is a self evident truth that where order and good management reigns, every one contributes to the success of the establishment with his good will and skill; in a word, harmony is pleasing to all.

Having alluded to fire clay, above, being found in large quantities in this country let me say why this immense resource has not been made as useful as it should have been. Were it not for the intelligent discrimination manifested by a glass manufacturer, now of Philadelphia, Mr. W. T. Gillender, the utility of Missouri clay for pot making would be to this day a mooted point. Each glass manufacturer as is well known, manufactures its own pots for melting, and the pot maker is an important personage, at least in his own estimation, owing to the peculiar state of things existing. It is a noted fact that each factory pretends to have the best pots and the best pot maker, an opinion easily formed by those not acquainted with the properties of fire clay.

Let us suppose that clay is given to a pot maker, keeping him in ignorance of where it comes from, in order to avoid the splitting rock of his prejudices. Let him make a pot in his usual way. If the pot is not successful, he having learned his trade in the old routine, it is useless to seek a remedy from him, for let him tread out of his usual circle, he is lost and will not fail to charge the failure to the bad quality of the clay, and as I said before, his all-powerful opinion will shape that of his employer. The success of a factory depending especially on the good quality of pots, care should be taken and researches made by the manufacturer to attain the utmost perfection in this important branch instead of being dependent upon ignorant pot makers. This would not happen if the manager was well acquainted with this business; the success of this branch would depend upon him entirely. American clay properly prepared and well proportioned without addition of any other clay, is capable of making as good pots as those made from clay brought from Europe at great expense. J. P. Colne

Washington, D. C.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

A Mechanical Question.

Messrs. Editors:—A gentleman in this section of country has been testing the draft of different wheel carriages to ascertain the most perfect construction that can be made to secure the ease of draft. His experiments show that 100 lbs. weight can be drawn up an inclined plane that rises four and a half inches in four feet, with 8 lbs. and 14 ounces draft and he expects to make the draft a few ounces less.

Be that as it may, the present development is a contradiction of correctness of scientific formulas upon which calculations are made. Not taking into account any allowance for friction, the formulas say that power is gained in proportion to the increased space through which it moves over that of the object moved.

According to the theory, four and a-half inches are contained in four feet, 10 and a little over $\frac{7}{10}$ times, which amount of hight the 100 lbs. weight is lifted, in moving four feet horizontally. Now if we divide the 100 lbs. lifted, by the draft of 8 lbs. and 14 ounces, it will be found that the draft is contained in the weight 11 and a little over $\frac{1}{10}$ times.

© 1867 SCIENTIFIC AMERICAN, INC.