stopper. Mr. Bessemer, however, prefers to use a movable conical stopper attached to the end of an iron rod, as shown in Fig. 1. The conical piece of fire-brick, *f*, is circular in form, and spreads outward in a curved line at *f**, for the purpose of deflecting the flame and preventing its too powerful action on the iron rod, *g*, which supports the cone, *f*. The rod, *g*, protrudes through the back wall of the converting house, or may be supported on a bracket or piece of iron framing in connexion with the standards which support the vessel, and by means of a screw or lever, the cone, *f*, is made to advance further into or recede from the mouth of the converter, thus increasing or diminishing the area of the annular opening at *e**, and regulating the pressure of the confined gases in the vessel.

"In some cases it may be found desirable to render the stopper, *f*, self-acting by applying a spring or weighted lever to press it forward against the pressure of the escaping gases, so that either by reason of its enlargement by the accretion of slags on its surface or by being partially burned away it will occuppy such a position in the mouth of the vessel throughout the process as will give a sufficiently equal amount of back pressure, and prevent that pressure from exceeding what is necessary by any partial clogging up of the escape opening; or in lieu of employing a conical stopper a flat or other shaped surface may be employed, the object in either case being to enlarge or contract the opening for the escape of flame as found desirable at different stages of the process. The pressure of the confined gaseous products is indicated by a mercurial column. This gage will allow the workmen to employ from time to time such an amount of internal pressure in the vessel as the known qualities of the material he employs may render necessary.

"When crude molten iron, or remelted pig, or refined iron is decarburized, or partially decarburized, or converted into refined iron, or into malleable iron or steel by the action of nitrate of soda or potash, or by other oxidizing salts, or when such decarburation or conversion is effected by any other processes in which the decomposition of nitrate of soda or potash, or other oxygen yielding salts alone or mixed with metallic oxides takes place in, or below the fluid metal in a converting vessel or chamber, a large amount of heat is absorbed and rendered latent, thus tending to solidify the metal and rendering it unfit for forming into ingots or castings without being remelted.

"To obviate this and raise the temperature of metal (while so treated or converted) to such a degree as to allow it to be cast into ingots or other cast articles or masses prior to its solidification, Mr. Bessemer proposes to construct the vessels in which the process is to be carried on of great strength, preferring to use stout iron or steel plates well riveted and caulked, and, if needful, further strengthened by stout hoops. The mouth of the vessel is to be made very small, Mr. Bessemer preferring for that purpose to employ a well burned fire-brick ring, into which a long taper cone of the same material is placed. The cone is fastened to a long rod working in suitable guides, so as to keep it central with the mouth of the vessel. The space between the exterior of this cone and the interior of the fire-clay ring determines the area of outlet for the gaseous products given off during the time that the decomposition of the nitrate or other oxygen yielding materials is going on, and a weight or spring lever acting on the rod to which the fire-clay cone is attached may be made to regulate the amount of pressure required to lift the cone and permit the escape of the gaseous matters.

"The arrangement of which we have just spoken is illustrated in Fig. 2, which represents a vertical section of the upper portion of a converting vessel or chamber in which molten pig or other carburet of iron is to be treated either by the injection of the fluid nitrate into the molten metal, as patented by Mr. Bessemer in March last, or in which vessel the nitrates or other oxygen yielding salts or substances are so brought in contact with the hot metal as to be decomposed. The outer shell, *h*, of the vessel or chamber is made of thick plates of iron or steel securely riveted and caulked at all joints, and capable of withstanding safely a pressure of from five to ten or more atmospheres. For the convenience of lining the vessel, the upper part may be removed by unbolting the stout flanges, $h^1$, and one or more hoops, $h^2$, are riveted to the exterior of the vessel to strengthen it. A lining of fire-brick, ganister, or other refractory material, *i*, is used to defend the outer shell from the high temperature generated within, and previous to its use for conversion, Mr. Bessemer prefers to make a fire in the interior so as to highly heat the lining and lessen its power of absorbing heat from the metal.

"On the upper part of the dome an iron ring, *m*, is riveted, to which a flanged ring, *n*, is fitted. The inside of this ring is conical, and is made to embrace the conical fire-clay ring, *p*, through which the gaseous matters evolved during the process are allowed to escape. A cone of fire-clay or of iron, *g*, is attached to the guide rod, *r*, for the purpose of closing or diminishing the area of the outlet opening in the fire-clay ring, *p*, and on the upper end of the rod, *r*, are placed weights, *s*, to regulate the pressure. The rod, *r*, is guided vertically upward and downward by passing through the tubular guides and stuffing-box formed at *t t*, on the curved exit passage, *u*, which leads to a chimney, and conveys away the gaseous products escaping from the converting chamber.

"On one side of the vessel or chamber is a projection, *v*, on the upper part of which a ring of fire-brick, *w*, is retained in place by a conical flanged iron ring, *x*. The opening in the ring, *w*, serves for the admission of the molten metal to the vessel, after which the cone, *y*, smeared with fire-clay is lowered down into the opening of the molded fire-brick, *w*, and by means of the weight, *z*, is retained in place and prevents the escape of gaseous matters during the converting process.

"The cone, *y*, and its rod and weight, *z*, are suspended by a chain in the position shown during the period of running in the metal. When the metal so run in comes in contact with the nitrate or other oxygen yielding materials large volumes of gaseous matters are evolved, these matters instead of escaping freely from the converter rapidly accumulating in the vessel until the pressure within it is sufficient to raise the cone, *g*, and escape by the small annular opening thus made, the pressure being regulated by the weight, *s*. Hence the combustion of the carbon contained in the molten iron by reason of its union with oxygen derived from the decomposition of the nitrates or other oxygen yielding materials will be effected under considerable pressure; and the gaseous products, instead of expanding freely as under the ordinary conditions of combustion, will be in a highly condensed state, by which means their temperature will be considerably raised, and the intense heat so generated will be imparted to the metal and cause it to retain its fluidity."

## Correspondence.

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

### Straightening Chimneys.

MESSRS. EDITORS:—I was much interested in the account in your number of March 12, of straightening the tall chimney at Barmen, Prussia. Anything relating to building and maintaining chimneys of great hight involves questions of much interest to a great many people in these days of steam and machinery; and, judging from the numerous cases reported of the deflection of such chimneys from the perpendicular, and the methods adopted to straighten them, there is a want of more and better information on the subject.

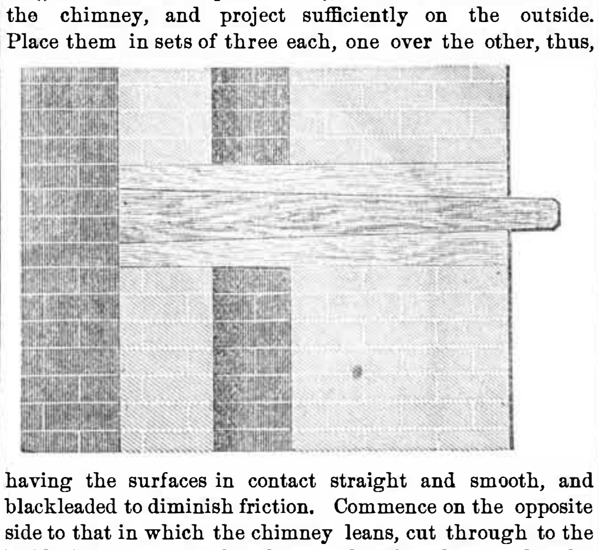
In reading the account above mentioned, I did not see any allusion to what is an indispensable part of all chimneys of that kind, namely, the inner chimney, or core. If that was absent, that fact alone would account for the deflection of the chimney.

Probably few outside of the trade are aware that the tall chimneys that surround us in cities and manufacturing towns are each composed of two separate and distinct chimneys, one inside the other. The inner one to conduct away the smoke, heat, and gases, and the outer one to support the inner one, and protect it from the weather. The reason is that if the outer chimney were subjected on the inside to heat more or less intense, and on the outside to the ordinary variations of temperature, the unequal expansion and contraction of the outside and inside of the same wall would soon cause its disintegration.

An interesting illustration of this principle was seen some years ago in this city, where a chimney was built with the core carried up inside, detached from the outer chimney, as it should be, until it reached the top, where, instead of dropping the inner chimney, and forming the coving, or crown, with the outer chimney, leaving the inner one free to expand or contract, they were connected with each other and built up together. The consequence was that when the fires were started and the inner chimney was subjected to heat, its expansion caused it to lift the whole crown up clear off the outer chimney, causing a horizontal fracture 3 or 4 inches in hight.

In regard to the Barmen chimney before mentioned, I would say that I consider the method adopted to straighten it as most unworkmanlike and dangerous, and I am not at all surprised that the chimney should vibrate to the extent that it did during the operation, or that the masons should "get frightened and leave the place."

I would suggest a much better plan than that of sawing out the joints. Have a number of oak wedges made of length sufficient to pass through the entire thickness of the chimney, and project sufficiently on the outside. Place them in sets of three each, one over the other, thus,



having the surfaces in contact straight and smooth, and blackleaded to diminish friction. Commence on the opposite side to that in which the chimney leans, cut through to the inside, insert one set of wedges, and wedge above and under them until they take a bearing. Repeat the process around the chimney, except on the lowest side, leaving spaces of a foot or more between each set of wedges. Then by driving the center wedge in each set inwards, as much of the chimney as rests on them is gradually lowered just at the places and to the amount required to bring it to an exact perpendicular. When that is done, brick up the intervening spaces, loosen and withdraw the wedges, and brick up in their places.

In conclusion I would say that my experience in that kind of work leads me to believe that sufficient care in planning and executing constructions of this kind is not always taken; and when a chimney like that at the Charlestown Navy Yard, in the building of which expense was a secondary consideration, swerves from the perpendicular, to the extent that it does, to say nothing of the large number of others that give trouble in many ways, it behooves those whose business requires tall chimneys, to look well to the construction thereof.

Boston, Mass. CHAS. A. FOX.

### Matter and Motion.

MESSRS. EDITORS:—In your article on page 175, in reply to Mr. Blake, you quote from four writers, to show that the term inertia is not always used to mean the same thing; when, if I can understand them, they agree as to the definition of the word, though one of them denies the fact of which it is the expression.

Certainly it is to be expected that new discoveries in science will work some changes in our ideas of things, but it does seem a little startling to say that the idea of the inertness of matter is obsolete; for is it not a principle of philosophy that a conception the negation of which is inconceivable must be true?

Then with respect to such motions as are imparted to matter, is it conceivable that it moves itself? If not, what else can it be but inert?

But suppose it under some circumstances to move itself; how is it done but by the exertion of force? And are not the force and the resulting motion commensurate? Then it follows (why not?) that force and motion are correlative, and that a given force produces a commensurate motion and no more; because inertia is opposed to it, and an equivalent of inertia is exchanged for an equivalent of motion. Except for this plain and easily understood principle, what would prevent an infinite motion from ever so small a force?

So it appears to me that the argument of Mr. Nichols and your own from molecular motion to the denial of inertia is a pure *non sequitur*, as it does not seem to alter the case at all, to say that matter moves itself.

The absurdity of the alternative to which the denial of inertia forces you, namely, that it is a natural property of matter that it moves itself about from place to place, is too absurd not to be remarked.

As to the idea that matter does either as molecules or masses move itself, I simply wait for the proofs, which when they come will undoubtedly astonish the apostles of the new philosophy, as well as every body else.

S. H. WILDER.

Deep River, Ct.

[Our correspondent must not put his own language into other people's mouths. No one has to our knowledge said that "matter moves itself," any more than they have said "matter forms itself; matter extends itself; matter makes itself to be impenetrable." What those who deny the state of rest in matter, say, is simply that matter constantly moves; and that under certain conditions, the motion of portions of matter decreases simultaneously with increase of motion in other portions; the increase and decrease being equal in all cases. It is believed by many that motion is an essential property of matter, as much as extension; in fact, that the so-called essential properties of matter, are merely concomitants of motion; that matter and motion are coexistent, and that neither can be recognized by the human intelligence without the other.—EDS.

### Relative Cost of Hoosac and Mt. Cenis Tunnels.

MESSRS. EDITORS:—Your recent article upon the Hoosac Tunnel, I think conveyed a wrong impression as to the relative cost of the Mt. Cenis tunnel and the Hoosac. You place the cost at Mt. Cenis at $1,500,000 per mile, and at Hoosac $1,900,000 per mile. By reference to Buffum's "Sights in France," etc., you will see that the cost of the Mt. Cenis tunnel is to be $26,000,000, of which France pays $20,000,000 and Italy $6,000,000, making the cost per mile over $3,335,000. The American engineers claim that their drilling machinery is of much superior construction, enabling them to do the work quicker and cheaper, and there appears to be truth in this assertion. For example, in the book referred to, it is stated that the drills are used up pretty fast at Mt. Cenis, and that 2,000 drills will be broken up before the work is done; but at Hoosac it is stated that not more than 50 of the Burleigh drills have been employed, all told; all are still good, although some of them have been in use for over 3½ years. B.

### Spontaneous Combustion of Oil Scrapings.

MESSRS. EDITORS:—On reading the article on Spontaneous Combustion, published in Vol. XXII., page 121, SCIENTIFIC AMERICAN, it instantly reminded me of what I myself saw about two years since. I was then engaged as foreman for a manufacturer of oil silk. In this process the belts of silk when dipped in the oil are hung upon hooks and part of the dripping oil falls to the floor. In the course of a few months the accumulation upon the floor is considerable. In the instance alluded to the proprietor ordered me to scrape the floor and put the scrapings in barrels and place them in a certain corner of the room up stairs. I refused to do it, explaining to him the danger of combustion, but my argument was ridiculed, and the scrapings were collected by the proprietor himself in three barrels and placed as described. They remained there but two days, and on the morning of the third I entered the rooms about six o'clock, A. M., and noticed a dense blue smoke. Feeling positive that the gas could not have produced it, I at once searched for the cause, and soon found it. I at once seized the nearest barrel which blazed from the bottom in a most terrific manner, and notwithstanding the intense heat, I succeeded in removing it out of the building. On returning I found it had set fire to the floor plank, an inch and a quarter thick. This extinguished, I drew away the second barrel, which also burst into a blaze from the bottom as soon as moved. The same result took place with the third, so that only for my timely entrance I feel certain the flames would have caused a loss of $30,000.

The above I submit as a warning to all engaged in the manufacture of such goods to place the scrapings from the floor where they can have free access to open air.

GARRET W. ANDERSON.

Peekskill, N. Y.

### Effect of Compressibility on Buoyancy.

MESSRS. EDITORS:—I have read the following answer in the column devoted to correspondents, No. 10, current volume: "Any solid substance which will begin to sink in water, will sink, if unobstructed, to the bottom. The reason is this. Any solid now known, is more compressible than water; compressing it increases its specific gravity and renders it less buoyant than before the pressure was put upon it. As it goes down then, its tendency to sink is increased rather than diminished." I have found the assertion contradictory to the established figures of recent experiments relating to the compressibility of liquid and solid substances; the coefficient of compressibility of water is about fifty-millionths for each atmospheric pressure, while that of mercury is but three millionths. Solid substances are far less compressible than liquid ones; so the coefficient of compressibility of iron is 0·5 millionth only, for the same pressure; this being deducted from its coefficient of elasticity demonstrated by M. Wertheim to be exactly equal; the formula has been adopted by M. Grassi for the correction of observed compressibility in piezometer.

This being admitted, the specific gravity of water will be increased more rapidly in comparison with the iron, when submitted to the same pressure and at the ratio of one hundred to one.

Describing by $d$, the difference of specific gravity between water and any heavier solid substance; by $c$, the coefficient of compressibility of water; and by $\acute{c}$, that of the solid; the value of required condensation of water, expressed by $x$, to counterbalance the specific gravity of the heavier body, can be found by the following equation:

$$x = \frac{dc}{c - \acute{c}}$$

Applying the formula to iron (specific gravity 7·8), the water to be equalized with its specific gravity put in the same condition of pressure, its primitive volume must be diminished 7·8787 times; that means, a compression equal to 157,574 atmospheric pressures, to a water column equal to one-fourth the terrestrial radius; passing this limit, the iron will float on the stratum.

This manner of calculation supposes that the coefficients of compressibility preserve their proportional value at this enormous pressure, which is not determined; but at all events, it demonstrates sufficiently that the tendency to sink will be diminished rather than increased, as the solid substance goes down in the water.

M. W. BEYLIKZY.

New York.

### Absorption of Oxygen by Charcoal.

MESSRS. EDITORS:—On page 189, current volume, an inquiry is stated by a correspondent, "Is there not in the property of charcoal to absorb oxygen a source of cheap extraction of this gas from the air?"

Two French chemists, MM. Laire and Montmagnon have been making experiments in this direction, and find that 100 measures of wood charcoal, freshly burnt, absorb 985 of oxygen and only about 705 of nitrogen. They proposed to pump out the oxygen and nitrogen from the charcoal and pass it over fresh coal, and re-pump it until the greater part of the nitrogen was eliminated and tolerably pure oxygen remained.

The direction in which experimenters should work is to find some substance, charcoal, membrane, etc., that will filter out the nitrogen and permit the oxygen to pass.

The late Mr. Graham came near the accomplishment of this result by using shavings of india-rubber, but the details of his process are wanting. Oxygen and nitrogen are so different in their properties that we ought to discover an easy way of separating them.

J.

New York city.

### Machinery Wanted at the South.

MESSRS. EDITORS:—I perceive you have noticed our annual State Fair that is to take place, commencing on the 23d of April.

I thought to drop you a memorandum of what is needed in our State, so that inventors throughout the United States could see what we most needed, and have their articles on hand.

Cart or wagon wheels of new pattern; force pumps to supply great bodies of water to our sugar houses; horse-power brick machines are much wanted—those that require that the bricks should be least exposed to the sun preferred. Every kind of new patent boilers for fuel is an object with us now; also knitting machines of all kinds; saw mills of all kinds, with new patent head blocks; cross-cut saws that will saw a tree up into fire wood where it falls, and a machine to split the wood.

M. SCHLAHE, JR.

Plaquemine, Parish of Iberville, La.

### Wear of Locomotive Wheel Tires.

MESSRS. EDITORS:—During the last few years I have been engaged in turning locomotive tires, and I have noticed that almost invariably the tires on the forward driving wheels were worn from $\frac{1}{32}$ to $\frac{4}{32}$ of an inch smaller than those on the back wheels.

The instances noted were from locomotives with four driving wheels and the ordinary four-whe ...ck in front. Can you or some of your readers give a ... for this excess of wear on the forward driving whee... ...comotives?

Clinton, Iowa.

...IRAM R. JONES.

### Dangerous ...oves.

MESSRS EDITORS:—In your issue of March 12, there is an article headed "Dangerous Stoves," I therefore take the liberty to inform the writer and your numerous readers that, in my estimation, feet or legs to a stove are a superfluous nuisance. In selecting my stove, I took particular notice it had a large base that dipped down well below the bottom on which the fire rests; I then made a frame of wood just to fit under the stove, and covered it with zinc. I then placed the stove upon this platform, minus legs and feet, in two or three inches deep of ashes, and built a fire, and have feared no danger from fire or the stove falling down. I manage to heat four rooms with one stove in the following manner: In the ceiling of the living room over where the stove sits (for it don't stand) there is a ventilating thimble which allows heat to pass into a chamber sufficient to warm it and make it comfortable in all kinds of weather. The stovepipe passes through a side wall into a "drum," which heats a bed-room, then up through the ceiling into another room to heat a chamber bed-room, thence into the chimney.

Now for the results; the heat is all expended in the house just where it is most needed, and the wood consumed is no more than is commonly used to warm one room. I would say that my stove is soap stone No. 2, and does not get cold from the time the fire is lighted up in the fall till it is taken down in the spring.

JNO. T. SMITH.

Cedar Rapids, Iowa.

### Dangerous Stoves.

MESSRS. EDITORS:—I see an article on page 173, present volume of your paper, headed "Dangerous Stoves," made so by the legs falling out, and the stoves falling down.

A similar accident took place a number of years since with my stove, nearly killing a small child. A neighbor met with a similar accident in which a kettle of boiling water was precipitated on a child, scalding it to death.

To prevent a like occurrence, we procured a half-inch drill, drilled a hole through the bottom plate of the stove and legs, counter sunk the hole in the plate to prevent the head of the bolt to be placed in it, from rising above the plate; the bolt extending through the legs to receive a nut which was screwed up tight, holding the plate and legs firmly together, all was quickly and cheaply done; since then, when we buy a new stove, the first thing done is to fasten the legs in this manner. The expense and time required to do this are so small that all stove makers and menders should be compelled to make preparation to have their stove legs so fastened before sold.

E. G. PATTER.

Bellevue, Iowa.

### An Error Corrected.

"It is said a new description of lava is being thrown from the crater of Vesuvius since the last eruption, consisting of crystallized salt. This beautiful phenomenon has hitherto been unknown in volcano natural history. The scientific bodies are engaged in investigating."

MESSRS. EDITORS:—I clipped the above from the New York *Christian Leader* of Jan. 1st. I first saw it in that paper, and on the 8th of January it made its appearance in the SCIENTIFIC AMERICAN, with the exception of the last brief sentence of six words. I am of the opinion it is time it was corrected. If corrected in time, I am in hopes those investigators alluded to, will not hazard their precious lives by penetrating into the bowels of Vesuvius on a salt-exploring expedition, until they have read Humboldt's Cosmos, Vol. V., page 413. It is:

"Common salt is from time to time found as products of sublimation, even in lava streams on Hecla, Vesuvius, and Etna, in the volcanic chain of Guatemala (volcano of Izalco), and above all in Asia, in the volcanic chain of the Thianshan.

MRS. GEORGE HENRIUP.

Geneva, N. Y.

### Lacquer.

No. 1.—Shellac, 120 parts; sandarach, 45 parts; mastic, 30 parts; amber, 30 parts; black resin, 90 parts; dragons' blood; 30 parts; turmeric and gamboge, each 24 parts; rectified spirit, 1,000 parts. Digest until dissolved; then strain. No. 2.—Seedlac, 120 parts; sandarach, 120 parts; dragons' blood, 16 parts; gamboge, 2 parts; turmeric, 2 parts; Venice turpentine, 50 parts; clean sand, 150 parts; rectified spirit, 1,000 parts. Digest in a sand bath, and strain. No. 3.—Seedlac, gamboge, and dragons' blood, each 120 parts; saffron, 30 parts; rectified spirit, 1,000 parts. Digest with heat, and strain. No. 4.—Seedlac and sandarach, each 120 parts; dragons' blood, 15 parts; turmeric, 2 parts; gamboge 2 parts; Venice turpentine, 60 parts; spirit of turpentine, 1,000 parts. Digest with heat and strain. Aloes is sometimes used to give it a dark color.

ADHESION OF AIR TO GLASS.—M. Auguste Houzsau has called the attention of the French Academy to the presence of nitrogen in what was supposed to be pure oxygen. He shows that it is extremely difficult to get rid of the film of air adhering to glass vessels, even after considerable "sweeping" with currents of oxygen, or other gas. In his experiments on the production of ozone by the electric shock, he found it necessary to make the narrow tubes he employed red hot, and while they were in that state to pass oxygen currents through them.

### New Blue Pigment.

The new pigment is obtained in the following way, according to the directions of M. Tessié du Motay, and can be easily prepared in a few days. Take of tungstate of soda, ten parts; tin salt—protochloride of tin, eight parts; yellow prussiate of potash, five parts; prechloride of iron, one part. Dissolve these substances separately in as small a quantity of water as possible. Mix the solution of the tin salt with that of the tungstate of soda, and the solution of the perchloride of iron with that of yellow prussiate of potash.

The two mixtures so produced are then to be added to each other, the whole thoroughly shaken, and allowed to stand for some hours. The precipitate produced in this way is caught on a filter, and then when slightly washed and drained, is spread on earthenware plates and exposed to the sunlight for a day or two. The precipitate, at first an undecided blue, gradually assumes a more marked shade. After a day's exposure to light the substance is powdered and washed on a filter with water, so as to free it from soluble matters. It is again spread out and exposed to light for several days longer, until a pure blue tint is developed. It is again powdered and preserved for use.

The new blue is of a beautiful tint, resembling the variety of Prussian blue, called "Berlin blue," but it possesses more "body" than the latter.

In order that our readers may be able to judge of the value of this substance we give M. Tessié du Motay's analysis of it. He finds that it contains in one hundred parts—

| | |
|---|---|
| Moisture | 7·85 |
| Tin | 31·69 |
| Iron | 5·42 |
| Cyanogen | 19·44 |
| Blue oxide of tungsten, | 35·60 |
| | 100·00 |

It is evidently a mixture of the finer variety of Prussian blue with the remarkable blue oxide of tungsten.

So far for the composition of the new pigment: its properties may now claim our attention. It is believed to be quite unalterable by light, because it is produced by the same agency; and M. Tessié du Motay remarks that it is illogical to suppose that the power which has produced the new blue will also destroy it. So far as the logic is concerned we think that little importance need be attached to such an argument, as there is no good reason why the action of light should not go on to destruction of the color; but we are rather inclined to think that preservation of the pigment in darkness would be very likely to destroy the color of the blue oxide of tungsten, as it has a considerable tendency to pass by oxidation into tungstic acid or anhydride—a greenish-yellow substance; but the presence of the Prussian blue is, to a certain extent, a safeguard against this danger.

It is well known that ordinary Prussian blue is easily bleached by an alkali, as our readers are no doubt aware that it is not very unusual for grocers to write on their blue papers in which they usually make up tea with a weak solution of caustic potash; wherever the colorless liquid comes in contact with the blue liquid, the Prussian blue used in preparing the paper is bleached, the letters or figures then appearing as white on a blue ground. The new pigment is but slightly altered by similar treatment, as the oxide of tungsten is unaffected by alkalies.

Again; the beautiful ultramarine blue so largely used in painting is unchanged by treatment with an alkali, but very readily decomposed and the color destroyed by very weak acids, though the latter have no effect on Prussian blue. M. Tessié du Motay's new pigment resists this treatment likewise, so that, while possessing a shade of color intermediate between ultramarine and Berlin blue, it resists the reagents which destroy the two other pigments.

It is only necessary to add that tungstate of soda can be manufactured in large quantities and at a very low rate, since a mineral of tungsten, called "wolfram"—tungstate of iron and manganese—occurs in considerable quantities in Cornwall accompanying the ores of tin. This wolfram is a nuisance to the Cornish miner, who would be glad to find a good market for it; and therefore, since all the other materials, including solar light, are cheap, the "photographic blue" bids fair to attract some attention—more especially since it is less likely to be injured by the prolonged action of light than other blue pigments.—*British Journal of Photography.*

AT a recent meeting of the Paris Academy of Sciences, M. Feil exhibited specimens of flint glass of great density (Faraday's glass) obtained by a new process, enabling masses of this material to be manufactured, weighing from 25 to 35 kilos., perfectly pure, homogeneous, and free from striæ, and of a density equal to, and even greater than that of Faraday's. He also showed specimens of imitation precious stones, such as emeralds, sapphires, and white and colored rubies, as well as a specimen of a deep violet blue, rich in tone, and of a brilliancy surpassing that of the finest amethysts. They are stated to be nearly equal in hardness also. The author, in his communication, states that he uses for the flint glass aluminates of lime, of lime and baryta, of lead, and of bismuth, etc., and for crown glass, aluminates of magnesia, silicates of magnesia, and of alumina.

MIXTURE FOR CLEANING FURNITURE.—Cold-drawn linseed oil, 1 quart; gin, or spirit of wine, half a pint; vinegar, half a pint; butter of antimony, 2 ounces; spirit of turpentine, half a pint. N. B. This mixture requires to be well shaken before it is used. A little of it is then to be poured upon a rubber, which must be well applied to the surface of the furniture; several applications will be necessary for new furniture, or for such as had previously been French polished or rubbed with beeswax.

### Improved Apparatus for Measuring Liquids.

A means whereby the measurement of liquids could be accurately accomplished without the use of sets of measures into which various liquids must be drawn, has long been a desideratum. The possibility of drawing the required quantity with rigid exactness, directly into the vessel designed for its transportation, is something much to be desired, both as a matter of convenience and of cleanliness. In the case of inflammable liquids, such measurement is also desirable on the score of safety, since the near approach of any artificial light is not necessary.

With the apparatus herewith illustrated, liquids may be accurately measured in drawing, when there is light enough to place the receiving vessel properly; and the annoyances and inconveniences attendant upon the use of portable measures are wholly avoided.

The operation of the apparatus will be at once understood by inspecting the engravings; Figs. 1 representing the complete device, and Fig. 2 showing the same in vertical section.

In these engravings, A represents the outer case, divided into an upper and lower chamber by a diaphragm, B; any convenient quantity of liquid being poured into the upper chamber through the opening at C. It is drawn when wanted through the strainer, D, and subsequently through the measuring chambers, E F G H, and through the tube, I, out through the faucet into the vessel destined to receive it; the dotted line showing the course of the fluid from its entrance to its exit from the apparatus. The chambers, E, F, G, H, and the tube, I, hold, together, one gallon in this instance; but they may be made to hold any quantity desired. The chamber, E, holds half a gallon; the chamber, F, one quart; the chamber, G, one pint; the chamber, H, a half pint, and the tube, I, also one half pint. The measurement of these chambers and the tube, I, are adjusted to accuracy by screw spindles, L.

The upper chamber of the apparatus and the measuring chambers, E,F,G,H, and I, communicate with each other only when valves actuated by the rods, K, are raised. The rods, K, are inclosed by vertical tubes, which ascend to the top of the case; and vent tubes (not shown in the engraving) are also supplied to each measuring chamber so that the flow may be rapid.

The valve rods, K, are held up by springs, so that, when it is not desired to draw any liquid, the chambers all communicate; and of course the measuring chambers will instantly fill and keep full so long as one gallon remains in the upper chamber. The state of the liquid in the upper chamber may be indicated by any suitable form of gage. Thumb knobs at the top of the rods are arranged as shown, and marked one gallon, half gallon, one quart, one pint, and half pint. The thumb knobs engage in the horizontal portion of the slots in which they slide, by a slight rotary movement, so that any valve once closed will remain closed until the knob is released.

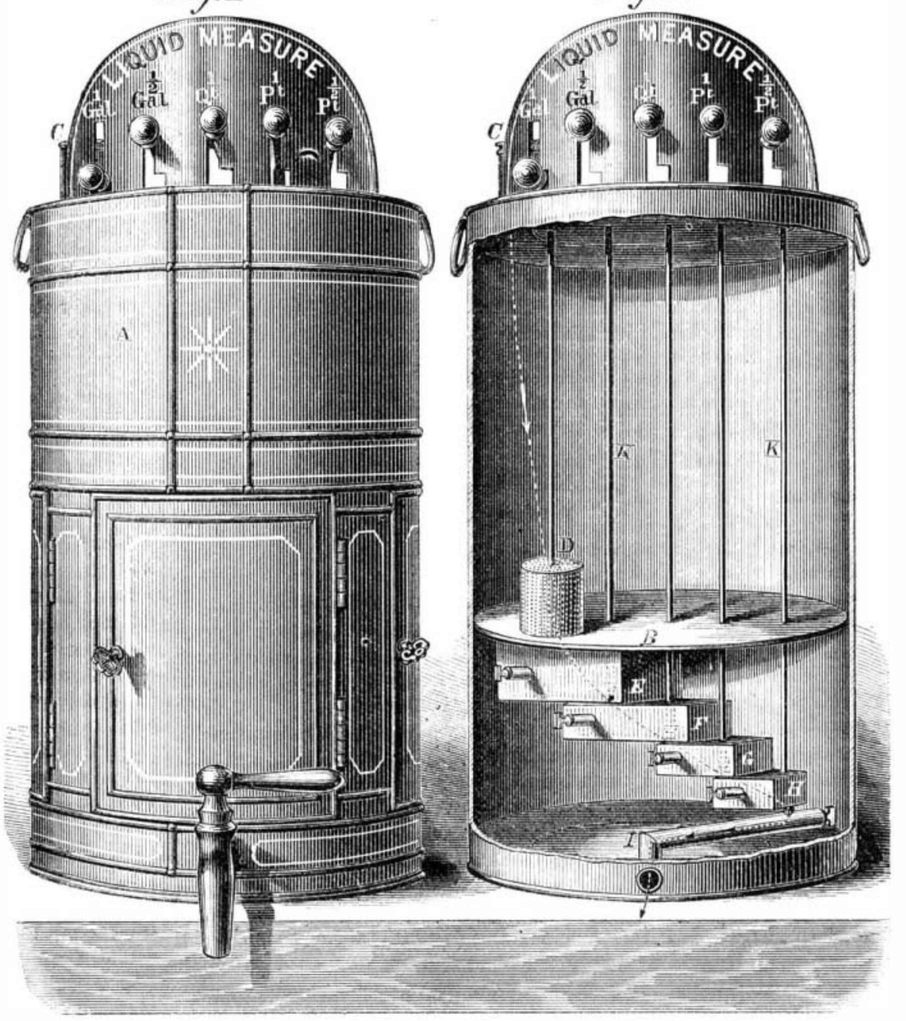
If it be desired to have a half pint of the liquid, the knob so marked is depressed. This closes the valve corresponding to the knob, and all flow from chambers above the pipe, I, is cut off. Upon opening the faucet, only the contents of the pipe, I, will be discharged; that is, a half pint. If one pint is desired the knob corresponding to that measure is depressed, and so on for all intermediate measures up to the full measuring capacity of the apparatus.

Each of the several chambers has an inclined false bottom, so that full delivery of its contents is secured, and the chambers are reached for regulating and sealing through doors shown in Fig. 1.

The apparatus may be applied to the filling of barrels, a large size being made for that purpose, and is capable of extension to all wholesale and retail measuring. It may also be connected to liquor casks and applied to milk cans, for which it seems particularly suited, as the measures can be made so as to be readily reached to scald and clean them.

Patented by Martin McDevitt, of Hampton, Va. For further particulars, or for State, county, and town rights, address McDevitt & Woodward, Hampton, Va.

Fig. 1 Fig. 2




LIQUID MEASURING APPARATUS AND STORE CAN.

### The Fire at Hoosick Falls.

The Troy *Times* gives the particulars of the fire on Sunday in the village of Hoosick Falls, by which all of the works of the Walter A. Wood Mowing Machine Company on the north side of the Hoosac river were totally destroyed, excepting one large storehouse. The fire broke out in the main building connected with the works, the machine shop, and destroyed that edifice, the carpenter shop, the blacksmith shop, one storehouse, the office, the foundery, a building in which castings were cleaned, and five tenement houses, occupied by the families of seven of the operatives of the company. The patterns of the company were not injured—the men employed at the works rushing into the pattern shop and removing them at the risk of their lives. The loss is upward of $400,000; and upon it there is an insurance of $245,000, in nearly fifty different companies.

The buildings on the south side of the river were uninjured. These consist mostly of the Caledonian Mills (formerly the Merritt prope d will be kept running as formerly. Immediately u extent of the calamity being determined, Mr. Wood rders for the erection of new works, the plans were prep. and to-day a large force of men is engaged constructing t. ew shops. It is believed the new foundery will be in oper. on soon—the cupola of the old one being available for use immediately.

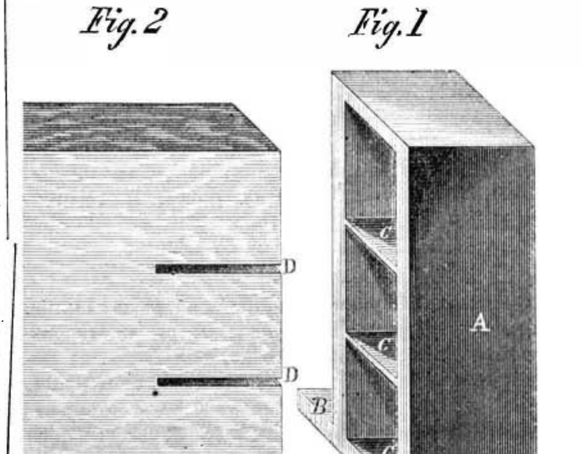
In 1859, also, the works were destroyed by fire. Mr. Wood then set himself with his accustomed energy to the task of rebuilding them, and in two weeks they were in operation.

Previous to the late fire the company were turning out one hundred and fifteen machines per day, and within a week it is thought arrangements will be made by which at least fifty per day will be manufactured. Four thousand complete mowing machines were stored in the storehouse which was not burned, and these will be sufficient to enable the company to keep up with their orders.

### GALMANN AND RUHE'S IMPROVED JOIST PROTECTOR.

It is well known that the ends of joists placed in walls, particularly in lower floors, are in the ordinary way, exposed to dampness, and consequent decay. In the device we herewith illustrate, we think, an adequate remedy for this has been found.

Fig. 2 Fig. 1




It is simply a box support or protector, of cast iron, made in the form shown in Fig. 1, A being the side walls of the box, C horizontal partitions, and B a bottom flange or base.

In inserting the joist, slots, D, are sawn in the end, into which the partitions, C, enter when the joist is placed in its proper position. This gives a greater number of bearings.

We think this device, simple as it appears to be, is a very practical and useful one, and have no doubt it will meet with with favor from architects and builders.

Patented, through the Scientific American Patent Agency, Feb. 1, 1870, by H. Galmann and Charles Ruhe, of Buchanan, Pa. Address as above for further information.

IT is thought the Mont Cenis tunnel will be completed about the end of January, 1871.

### OBITUARY--SETH BOYDEN.

We regret to record the death of Mr. Seth Boyden, who, at the time of his death, was one of the oldest, as he had been in his life one of the most prolific, inventors this country has produced. Mr. Boyden invented and commenced the manufacture of patent leather at Newark, N. J., in 1819, having taken up his residence in that city in 1815. He invented a brad machine, in 1816, which largely reduced the cost of manufacturing brads. In 1826 he made the first specimens of malleable castings, and continued in their manufacture till 1831. About this period he devised the first locomotive with outside connecting rods. He also devised a cut-off, and was of much assistance to Professor Morse in working out the details of electric telegraphy. It is said that he produced the first daguerreotype ever taken in this country. He also, in 1849, succeeded in making spelter, and laid the foundation for such success as zinc mining has attained in this country. He subsequently succeeded in imitating Russian sheet-iron, but at a cost which would not admit of competition with the foreign article. One of the latest of his inventions was a machine for making hat bodies, which has gone into general use.

The last time we met Mr. Boyden was about a year since, in a hat-manufacturing establishment in Newark, where his machines were employed. We found him in the office reading proof sheets of a paper upon some subject connected with electricity. Age and the ordinary cares and pains which accompany it, seemed entirely forgotten in his enthusiasm for science; for Mr. Boyden, though a practical man, was one of those scientifically practical men whose zeal is directed by knowledge. Perhaps no man of his time has done more to promote the industrial arts in this country than Mr. Boyden, who, though his inventions have been mines of gold to others, lived a poor man, and died at the age of 82 a poor man, in all except the respect and honor which reward a good life.

### Length of Journals.

Another consideration of considerable importance to the smooth and safe working of shafting is the length of the journals. From a number of years' experience I have been led to believe, that with cast iron, one and a half times the diameter of the shaft is the best proportion for the length of the bearing, and with wrought iron, one and three quarters the diameter.

On the question of shafts revolving in the steps of plummer blocks and the proportions necessary to effect motion without danger of heating, it is essential (without entering largely into the laws of friction on bodies in contact) that we should ascertain from actual practice and long-tried experience the best form of journals of shafts adapted for that purpose. The lengths proportionate to the diameters have already been given, but we have yet to consider the dimensions of the journals of large shafts where they are small in comparison with the pressure or the weight they have to sustain. Let us, for example, take a fly-wheel shaft and the foot or toe of a line of vertical shaft extending to a hight of six or seven stories in a mill filled with machinery, and we have the safe working pressure per square inch as indicated in the last column in the following table:

| DESCRIPTION OF SHAFT. | Length and diameter of shaft in inches. | No. of square inches in bearing. | Weight on bearing in lbs. | Weights in lbs. per square inch on bearing. |
|---|---|---|---|---|
| Fly-wheel shaft, wrought iron....... | 18 x 14 | 252 | 45,024 | 178·21 |
| Vertical shaft, cast iron............... | -- x 11 | 95 | 23,061 | 242·70 |
| Horizontal shaft, cast iron........... | 15 x 10 | 150 | 6,000 | 40·00 |
| Horizontal shaft, wrought iron...... | 6 x 3 | 18 | 540 | 30·00 |
| " " | 2 x 4 | 8 | 160 | 20·00 |

From the above it will be seen that in fly-wheel shafts the pressure should never exceed 180 lbs. per square inch, and in that of the toes of vertical shafts 240 lbs. per square inch. Even with this latter pressure it is difficult to keep the shafts cool, and it requires the greatest possible care to keep them free from dust or any minute particles of sand or other sharp substances getting into the steps. The feet of vertical shafts also require the very best quality of gun metal for the shaft to run in, and fine limpid oil for lubrication to prevent the toe from cutting. It is, moreover, necessary for the shaft to fit well on the bottom of the step, and not too tight on the sides, and to have a fine polish.

Another point for consideration is the proper form of the journals of shafts, and that is, they should never have the journal turned or cut square down to the diameter.

From a series of interesting experiments it has been shown that the square-cut shaft loses nearly one fifth of its strength, and by simply curving out the shaft at the collars of the bearing, the resistance to strain is increased one fifth.—*Fairbairn's Principles of Mechanism.*

THE North German Ocean Observatory last year concluded an important examination of the courses followed by steamships between the Lizard and New York, to discover by what route a steamship can accomplish the distance between the two points in question, at various seasons of the year, in the shortest time.