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### Permanent Way of Railroads.

A very interesting discussion recently took place on the above subject at a meeting of the Society of Engineers in London. It arose from the reading of two papers on the subject—one by W. Bridges Adams, C. E., and another by P. M. Parsons, C. E. The facts elicited were of considerable importance. It was stated that one thousand miles (single line) of iron permanent way had been laid in England, and that Greaves' system (illustrated on page 89, this vol., SCIENTIFIC AMERICAN,) had been extensively and satisfactorily used in Egypt. As to the assumed rigidity of cast iron permanent way, an objection urged against this system by some persons, this had been demonstrated to be a fallacy. It was found after a number of years of hard usage to be in an excellent state of preservation, and had not produced any injurious effect upon the rolling stock—engines and cars. The general opinion of the engineers present seemed to be that cast iron sleepers were preferable to those of wood.

### Curious Chemical Explosion.

On the 25th ult., while the assistant of Professor Doremus was preparing some oxygen gas, in the laboratory of the Medical College, this city, from the chlorate of potash, the receiver exploded with terrific violence, shattering the windows and otherwise doing considerable damage. At the time this accident took place, neither the Professor nor any other person could account for its cause. The gas itself is not explosive. What, then, was the cause? The flask containing the chlorate of potash, from which the gas was generated, became red hot, consequently the gas passed over in a highly heated state. In this condition, it is believed, it decomposed a portion of the receiver, which was india rubber, converting it into carburetted hydrogen gas, which being saturated with the oxygen, acquired a highly explosive character and was ignited by the hot oxygen.

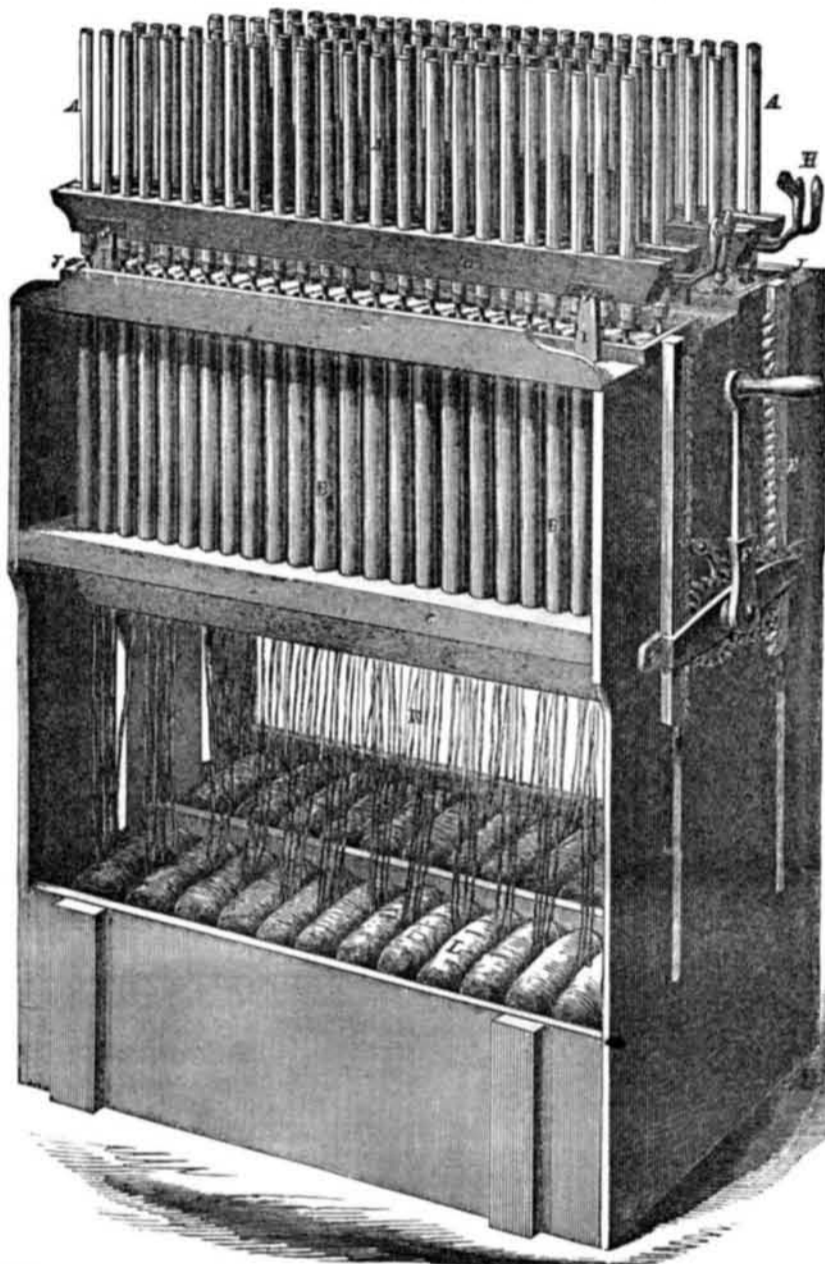
### The Menal Tubular Bridge.

The Philadelphia Ledger, which is usually so correct in mechanical matters, gives Brunel, Jr., too much credit in attributing to him the authorship of the above named celebrated bridge. William Fairbairn, C. E., discovered the best form of bridge, and he certainly is the inventor of it, as it is now constructed. Brunel, Jr., had nothing to do whatever with its construction or erection.

### Caution to Flies, Mosquitoes, Roaches &c.

We have received from Mr. I. S. Clough, inventor, 168 Broadway this city, some samples of his ingenious fly, mosquito, and roach traps. They are sure death to all unfortunate vermin which enter. We have seen practical evidence of this fact. These traps are particularly useful at this season of the year; and as they are cheap in price and ornamental in appearance, they will please everybody.

## HUMISTON'S CANDLE MACHINE.



Although in large towns and under favorable circumstances for the introduction of the successive innovations, it may with propriety be said that candles have long since given way to oil, and this again to burning fluid, which latter has been, in turn, superseded by gas, there are peculiar conveniences attending the use of the ordinary tallow candle, which will probably forever create for it an extensive demand. The many processes for forming these may be included under the heads either of dipping or molding, and the superior perfection of the product induces a strong preference for the latter. There are several machines in use to facilitate the manufacture by this method of these important illuminators, one of the most important and efficient of which is represented in the accompanying engraving. The wicks are drawn, by an automatic movement, through the mold, and held in place, while the melted tallow, poured by hand, congeals around them, and the finished candles are expelled by an easy movement, and conveniently removed in dozens or hundreds at a time, by the aid of simple clamps which grasp them.

The machine is a tolerably simple construction of moderate size, as represented in the accompanying illustration. The view is taken at a moment when the candles have just been thrust up from the molds, and are in the act of being seized by the clamps for removal.

A represents the candles, which are molded base uppermost. B are the molds of tinned

iron, or any suitable material slightly tapered. C is the flooring on which the molds are supported, and which is, in some of these constructions, lined with lead, and made to support ice water, which surrounds the molds, B, to hasten the cooling. D represents a movable platform capable of sliding vertically in the slots at each extremity, and attached to which are racks, E E, operated by the crank, F, which is turned by hand. Fixed in D are tubes or hollow plungers, smaller than the candles, through which the wicks, K, are led from the spools, L, below. When the candles are sufficiently cooled in the molds, revolving the crank, F, elevates D, and consequently thrusts them out at the top as represented. The upper ends of the tubes or hollow plungers are spread and made to fit nicely to the ends of the candles, as shown at the lower extremities of A. To facilitate the pouring of the tallow into the molds after the frame, D, has been depressed by a counter revolution of the crank, F, the cast iron troughs, J, are provided at the top as represented. G represents the clamps, each of which are composed of four parts, to embrace two rows of candles, all operated by one movement of the handles, H. These clamps are supported on the standards, I, and may be readily removed by hand to deposit them in the boxes.

The operation of candle making by this machine is simply as follows:—Commencing with the parts in the position represented, the pawl is elevated, and the crank, F, revolved in such manner as to lower the racks,

E, thus depressing the platform, D, and drawing downwards the hollow plunger through the molds. The wicks being still fast to the candles above, remain, of course, stationary. When D is in its lowest position, the troughs, J, are filled with tallow from the ladle, and after a few minutes cooling, the wicks connected to A, are cut by a rapid movement of a long handled knife, and the link represented being previously on the handles, H, the clamps, G, are lifted, and the candles, A, removed. Meantime the tallow in B has been rapidly cooling, and after a length of time depending on the temperature of the air, or of the water surrounding B, the superfluous tallow and wicking is scraped from the molds by an implement made to traverse in J, and the clamps, G, having been placed on the uprights, I, and opened as widely as possible to allow the easy ascent of the still somewhat soft candles, the crank, F, is moderately revolved, and the lot of candles gradually lifted, drawing with them the wicks, K, which are delivered from the spools below. The operation is very simple and rapid, and the machine cannot be too much admired, either for its labor saving qualities, or the cleanliness and perfection with which this operation is conducted.

This machine was patented April 4, 1854. For further particulars address the inventor, Mr. Willis Humiston, Troy, N. Y.

### Rezoil.

Mr. S. Piesse, in the *Gardeners' Chronicle*, says: It is well known that the patience and labors of the horticulturist are frequently rendered unavailable by the appetite of some insects. For preserving their flowers from these enemies, gardeners have adopted several plans, not one of which appears to be effective, more especially against the earwig, which is most to be feared as the flowers approach maturity. How many show dahlias are thus "cut off in their bloom!" With the hope that the following recipe will offer some check to these marauders, I send to you, assured that its cheapness and easy application will render it universally appreciated. Take of common rosin, 1 1-2 lbs.: sweet oil, 1 lb.: place them in a pipkin over the fire until the rosin is melted, stir the materials together, that they may be well blended; when cold the substance formed, which I call "rezoil," will be of the consistency of molasses. To use the rezoil it should be spread with a brush upon shreds or any fitting material, and wrapt round the stem of the plant; if any support is used, that should be brushed over also. No insect can possibly, or will attempt to cross this barrier; the rezoil never dries, but always remains sticky and clammy—its action as a trap is therefore obvious. To preserve grapes and other wall fruit we have only to nail a strip of list upon the wall round the entire plant, and then paint it well with the rezoil on both sides, if it can be managed, to keep insects from crawling under as well as over. Other modes of application will suggest themselves without my here enumerating them. Birds, cats and mice equally avoid soiling themselves with this substance.

The two mammoth steamships which are talked of to form a new line for California, will probably be constructed by Messrs. Perrine, Stack & Patterson, of Williamsburg. They are to be 450 feet long, with two pairs of paddle wheels.

The *Roanoke*, another of the new screw frigates, has just made a successful trial trip, and has been sent off on a cruise. Her speed under steam alone was eight knots, burning 3600 pounds of coal per hour.



substantially in the manner and for the purpose set forth.

**PICKERS FOR LOOMS**—T. J. Mayall, of Roxbury, Mass., assignor to himself and Geo. N. Davis, of Boston, Mass.: I claim a picker made of vulcanized rubber, without seams in the manner set forth.

**POMMY MACHINES**—O. F. Mayhew (assignor to W. H. Weeks and O. F. Mayhew) of Indianapolis, Ind.: I claim the combination and arrangement of the concave A, wings or dividers, C, C, C, and the adjustable openings D D D, when constructed and operated substantially as set forth.

**HOLDERS FOR SADDLE IRON**, &c.—Leon Londinsky, of New York City: I claim a detachable handle or holder, made in sections of wood, to be placed upon the handle of a smoothing iron for tailors, haters, and laundry use, constructed and arranged substantially as and for the purposes set forth.

**SPLITTING LEATHER AND HIDES**—Isaie Lippmann, of Paris, France, assignor to Michel J. A. Guist of New York City: I claim the method described for splitting skins, and by first submitting them to a felling or beating action as described, and then when so prepared, passing them through an apparatus or machine, the cutting apparatus of which has a rapid vibrating motion against which the skin is pressed slowly, substantially as specified, by which method of felling and cutting combined, I am enabled more perfectly to split skins than has heretofore been done.

**WATER GAGES FOR STEAM BOILERS**—D. E. Rugg (assignor to N. H. Forces and D. E. Rugg), of New York City: I do not claim a metallic pipe connecting with the steam and water spaces of the boiler in itself. Neither do I claim a transparent water gage in itself.

But I claim the combination of the metallic pipe, connected to the steam and water spaces with the surrounding transparent tube or cylinder to indicate by the ebullition of the fluid in said cylinder the water level of the boiler, substantially as and for the purposes specified.

**TO PREVENT COUNTERFEITING BANK NOTES**, &c.: C. D. Seropyan, of New York City, assignor to Wm. Couland, of New York City and J. B. Bald, of Philadelphia: I claim the application of at least two colors to the manufacture of bank notes, drafts, and all other papers representing value, both of which will equally or nearly so absorb the chemical rays of light, or neither of which will transmit or reflect such rays, and leaves the color or the tint of the paper less fugitive than the color of the other parts.

**DOOR BOLTS**—S. R. Wilmot, (assignor to S. B. Guernsey), of Watertown, Conn.: I claim the method described of forming a raised bar from a flat plate, without straining the material injuriously, by corrugating the plate at the ends of the bar, and sliding the sides of the bar from the plates, substantially as set forth.

**DIES FOR PUNCHING FORK TINES**—L. S. White, of Hartford, Conn., assignor to S. S. Rogers, E. W. Sperring, J. H. Ashmead and E. Hurlbut, of same place: I claim supporting the small bars or slender part of the ismperated die, b, by suitable supports or dies of metal, a, constructed and used, substantially in the manner described.

**PLOWS**—John Ormiston, of Center Township, O., assignor to D. N. Allard, Kokeby, O.: I claim unking and adjusting the shank of the point D, to and with the shank of the point A, by means of the screw and nut, piece D, the rack on the shank of said coulters, and the stirrup and set screw, substantially in the manner and for the purpose set forth.

RE-ISSUES.

**GRASS HARVESTERS**—Wm. F. Ketchum, of Buffalo, N. Y. Patented Feb. 10, 1852.—Re-issued Feb. 23, 1854: I claim, first, extending the shoe, H G, from the heel of the rack or finger bar upward and forward, and firmly connecting its continuation with the draught when the finger bar is located as set forth, so that the power by which the machine is drawn shall through the shoe be communicated to the shoe, H G, from the heel of the rack or finger bar, to assist in relieving the strain which would otherwise come upon the lateral connections of the rack or finger bar with the wheel frame, while the heel is enabled to slide over obstructions substantially as shown.

Second, when the main wheel and inner end of the finger bar or rack, D, are located relatively as described, I claim containing the shoe, H G, from the heel of the rack or finger bar upward and forward until the upper end of its extension reaches a part of the machine which always runs above the mown grass, and which will keep the said grass down and prevent it rising over the point of the extended shoe, thus aiding the shoe to ride over the mown grass even when accumulated before it, substantially as shown.

Third, I claim supporting the heel of the rack or finger bar sufficiently near the ground, and at a convenient distance laterally from the main wheel by arms extending upwards and forwards and upwards and backwards therefrom, and connected with the frame or spring bars firmly bolted across the frame in front and rear of the said rack or finger bar, while the said frame or bars are arranged as substantially shown.

Fourth, supporting the rack or finger bar at the side of and lower than the main frame, by means of auxiliary framing in a fixed position at the side thereof, and extending downwards and forwards so that while the finger bar is held as near the ground as desired, and lower than the main frame, it may be nearly horizontal, in the line of draught and at any convenient height, to avoid clogging, or accommodate the diameter of the main wheel as shown, such an auxiliary frame, as a whole is shown in the drawings, composed of bar C, rods E E I, and rack or finger bar D, but its details, may, of course, be varied, while the principle of my invention is retained.

Fifth, supporting the rack or finger bar, D, in its position at the side and lower than the main frame, by extending a strong bar, C, behind said rack or finger bar firmly supported by said frame, and rigidly connecting said rack or finger bar to said bar C, by a straight brace or braces, E E, said frame being elevated, and said bar being elevated and placed sufficiently in rear of said rack or finger bar to avoid clogging or lodging of the mown or fine grass against the said parts, and are arranged in relation to each other, substantially as shown.

Sixth, supporting the outer end of the rack or finger bar by a rod extending downwards and forwards from the cross bar, C, to the finger bar, parallel or nearly so to the face of the main wheel, when the frame and bar C are elevated above the rack or finger bar in the manner and for the purposes contemplated in the last claim, to avoid the falling or clogging of the cut grass against such rod, as set forth.

**GAS BURNERS**—O. H. Johnson, of Boston, Mass. Patented June 26, 1855.—Additional improvement, dated March 18, 1856: I claim combining the gas distributor, B, or the same and the purifier C, as described, with the burner, so as to operate therewith, substantially as set forth.

I also claim elevating the top of the orifice, a, for injecting the gas into the chamber of the burner above the base of said chamber, by a cone or its equivalent, and so as to form a chamber and said orifice for holding tarry matter, as well as for removing it from the orifice.

And I also claim extending the orifice, a, into the distributor, and among its wires, so as to attain advantages explained.

DESIGNS.

**COOKING STOVES**—Thos. H. Wood, F. S. Hubbell, and J. E. Roberts, of Utica, N. Y.

**COOKING STOVES**—J. D. Marshbank, of Lancaster, Pa.

Glue in Bones.

Bone contains from 30 to 36 per cent of earthy matter, chiefly phosphate of lime, and the remainder is gelatine. When bones are digested in muriatic acid, they become transparent and flexible like leather, the earthy matter is dissolved, and after the acid is all carefully washed away, pieces of glue of the same shape as the bones remain, which are soluble in hot water, and adapted to all the purposes of ordinary glue.

Expansion of Cast Iron in Solidifying.

**MESSEES EDITORS**—Allow a subscriber and constant reader to correct an erroneous statement made in the last number of your valuable scientific journal (page 301) in regard to the expansion and contraction of cast iron. Your two correspondents, Messrs. Beckwith, of Michigan, and Seward, of Indiana, have (as "practical" men very often do) made a mistake. It is unalterably true, as stated in your paper of May 16, (page 285), that "cast iron expands in becoming solid, and therefore takes the impression of the mold with exactness," provided the mold be perfectly unyielding. It is further true that "cast iron shrinks about one-eighth of an inch to the foot" after it has become solid, and hence the patterns must always be made in that proportion larger than the desired size. But it is not true, as added by Mr. Seward, that this shrinkage occurs to the metal "in becoming solid."

The fact is, that general as the law is that "heat expands bodies," the law is just as general that immediately after the melting point is reached a further heat will contract all bodies. At least, I am aware of no exception to the statement that liquids in being cooled down invariably expand for some time before being congealed, after which they again contract. Hence it is familiar to every founder that melted iron is heavier (that is, denser,) than solid iron, and that a pig of iron thrown into the freshly filled ladle will float on the top of the incandescent liquid, instead of going to the bottom, as it should if the melted metal were the more expanded. The same is true of lead, copper, silver, gold, &c.; and the same is true of ice, which, as known to every one, is more expanded than the water many degrees warmer, in which it floats. Water, like iron, "expands in becoming solid," and bulky anvils have been split by a few drops freezing within a small cavity, in attestation of this law of nature. D.

[Dr. Lardner in his "Treatise on Heat" says:—"Most of the metals undergo a sudden contraction in passing from the liquid to the solid state, but to this there are three exceptions namely, cast iron, bismuth, and antimony. A metal which contracts in passing from the liquid to the solid state cannot be made to take the shape of a mold, owing to its sudden contraction causing it in the solid form to be of less magnitude than the mold which it filled while liquid. It is for this reason that money composed of silver, gold, or copper cannot be cast, but must be stamped. Cast iron on the contrary, as it dilates, takes the impression of a mold with great exactness."] Dr. Lardner evidently teaches the doctrine that cast iron, antimony, and bismuth expand and stay expanded in cooling from a liquid state. His opinions on this point are somewhat different from those of our correspondent, whose ideas are clearly as follows:—Molten iron when poured into molds expands as its temperature decreases, until it congeals—becomes a solid—when it contracts; every one knows how much. Evidently, there is no difference between his views and those of Messrs. Beckwith and Seward, whom he intends to correct on the main point of the question. Their understanding of it is simply that castings of iron are of less magnitude than the iron in a molten state. They evidently did not intend to convey any other idea.

If, according to our correspondent, molten iron expands in cooling, then it should burst molds to pieces. He instances the prodigious power of water, in becoming ice and splitting anvils; surely, if the molten metal expands in cooling, he should be able to instance cases of the explosion of molds by the expansion of the metal, however small that expansion may be. On the other hand, if iron contracts in the mold, how are we to account for the exactitude of iron castings? His views on the contraction of the metal after it is congealed—all parts then shrinking equally—will account for this. If the metal shrunk in the mold before it was congealed, it certainly would not take an exact impression.

It is our opinion that the cause of the flattening of solid metal upon the top of molten metal is not that the latter is of greater spe-

cific gravity, according to our correspondent's views, but a repulsive action between the two. This can be demonstrated by dropping a piece of lead into molten tin; the lead, which is of far greater specific gravity, will actually float upon the tin.

It is necessary to make patterns in some degree larger than the intended iron castings, to allow for their contraction in cooling, which equals from about the ninety-fifth to the ninety-eighth part of their length, or nearly one per cent. This allowance is very easily and correctly managed by the employment of a contraction rule which is made like a surveyor's rod, but one-eighth of an inch longer in every foot than ordinary standard measures. When a wood pattern is made, from which an iron one is to be cast—the latter being intended as a permanent foundry pattern, as there are two shrinkages to allow for—a double contraction rule is employed, or one the length of which is one-quarter of an inch in excess in every foot.

Compasses on Iron Ships.

The Liverpool (Eng.) Compass Committee, formed by the late Dr. Scoresby and others, for the purpose of inquiring into the cause of, and, if possible, providing a remedy for, the extraordinary variations of the compass on board iron ships, has been disbanded. The Liverpool Courier says:—

"Its decrease could not have occurred at a more inopportune time than the present, when naval disasters through 'errors of the compass' are so rife. We need only instance the cases of the new iron clipper ships City of Madras and Charlemagne, lost within the past few days in the Clyde, and worth, with their cargoes, upwards of £200,000; of the iron screw steamer Arcadia, reported ashore in the Gulf of Smyrna; of the iron screw steamer Amelia, ashore near Milford; of the late total wreck of the iron screw steamer S. Andrew, on the coast of Syria; and of the complete loss, last week, on the Blackwater Bank, off the Irish coast, of the wooden clipper ship Emperor, a few hours after leaving this port for the Brazils. Surely these instances ought to suffice to show the imperative necessity that still exists for discovering a remedy for these destructive 'errors of the compass.'"

This is a subject of great importance, both as it relates to science and commerce. If the compass is unreliable on iron ships, on account of the local attraction of the magnet, then such vessels never can be unswervingly trusted, at least with such a guide as a magnet to direct them in their course over oceans and seas.

Notes on Science and Foreign Inventions.

**Steel Tubes**.—Messrs. J. J. Russel and J. B. Howell, England, have secured a patent for making tubes from sheets or strips of cast steel, previously rolled to the thickness desired. To make lap-jointed tubes they take a strip of cast steel of the required dimensions, and scarf the edges to form the joint; then they bend it into the shape of a tube, with the edges overlapping each other, as in making lap-welded iron tubes. The skelp thus prepared is put into a furnace, and heated to a welding temperature, then taken out, and passed between rollers over a mandrel, so as to weld the lap edges together, thus forming a cast steel tube, which is afterwards finished by being drawn through dies, to reduce it to the proper size. It is not easy to see in what respect this differs from that employed in making iron tubes.

**Waterproofing Paper, Cloth and Leather**.—P. Pierre Hoffman, of Strasbourg, has taken out a patent in England for a new varnish, which, when applied to the articles named in the above caption, render them, it is stated, air and water-proof, while at the same time they keep dry under all variations of temperature in the open air, are elastic, and do not become sticky—the latter being a fault common to a number of varnishes. The articles are coated with a mixture either of siccativ linseed oil and sulphur, called balm of sulphur, or of a mixture of sulphur with a quantity of siccativ oil, gum copal, gum opal, yellow amber, resin, india rubber, and gutta percha and

with the essences of turpentine or naphtha, &c., the se two latter keeping in solution the above named substances, which may be mixed separately or at the same time with the balm of sulphur.

The chief features of the invention consist in the use of the balm of sulphur for rendering fabrics air and water-proof, and in preparing the balm in the following manner:—When the siccativ or common drying oil has boiled for about two hours, in order to thicken it and separate its mucilaginous parts it is left a few days to settle, previous to decantation; then ten parts, by weight, are taken and submitted to slow boiling, during which small quantities of flowers of sulphur are added, and agitation is kept up the whole time. When from one to two parts of flowers of sulphur have been thus thrown in small quantities into the oily mixture, a transformation soon takes place, and the balm of sulphur now assumes a homogeneous mass of a brownish color, cohesive and elastic, somewhat like india rubber. The constituents of this composition or coating are then the following (by weight):—Ten parts of siccativ thickened linseed oil, and from one to two parts of sulphur in powder. The balm of sulphur, thus prepared, is used as the coating, and liquified either by the action of heat, or by means of solvents, such as spirits of turpentine, naphtha, &c. When it is desired to obtain a harder coating, gallipot gum, yellow amber and resin, &c., may be added.

The fabric to be coated is dipped into the material when hot, and in the liquid state, from which it is withdrawn and made to pass between six scrapers adjusted transversely above the vessel, so that any excess of the material is removed, and drops into the vessel again.

**Subohurized Oil Paint**.—At a recent meeting of the Society of British Architects, J. B. Daines stated that by subjecting 8 parts (by weight) of linseed oil and 1 part of sulphur to a temperature of 278°, in an iron vessel, he obtained a species of paint possessing singularly preservative properties. Applied to the surface of a building with a brush it effectually keeps out air and moisture, prevents deposits of soot and dirt, and preserves the beauty of the stone, wood or brickwork to which it is applied.

It has long been known that a portion of sulphur can be dissolved in oil, but until recently such a composition, as a paint or varnish, has attracted no notice, in fact, its preservative and impervious qualities when dry were unknown. It is well known to chemists that sulphur (the substance employed to give body to the oil) is unalterable in the air, and is not acted upon by moisture, hence its quality as a preservative for coating the outside of structures exposed to the weather. It is capable of preserving plaster of Paris figures exposed to the air, also monuments, and buildings of the brown free-stone, which are liable to detrition from the action of the weather. It is stated that it improves the color of the stone to which it is applied, as well as preserves it, therefore it is a most useful paint, and deserves to be very generally employed.

**Engineers and Firemen**.—In a communication to the Paris Academy of Sciences, Dr. Duchesne states that engineers and firemen on locomotives improve in health and grow stout during the first two years of their employment, but after this period a dangerous change takes place in their health. Among the earliest unfavorable symptoms are a weakening of sight, loss of hearing, and rheumatic pains, chiefly on the right side. These are followed by pain, and a difficulty of standing while the locomotive is in motion. We have never heard of American railroad engineers being affected in this manner.

**Salt in Dyeing**.—F. A. Gatty, of Accrington, Eng., has taken out a patent for the use of common salt (chloride of sodium) in dyeing with garancine, alizarine, and other preparations of madder. One pound of the salt is employed to every twenty-five pounds of the garancine in the boiler or a vat. The salt, it is stated, produces more beautiful and permanent colors. Some of our country dyers employ salt in coloring woolen goods black.