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 hard vulcanized rubber, without seams, in the manner set forth.

FOMINY 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 divisions, c c c c, and the adjustable openings D D D D, when constructed and operated substantially as set forth.

HOLDERS FOR SAD 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 hatters, 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. Guiet of New York City: I claim the method described for splitting skins, and by first submitting them to a fulling 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 projected slowly, substantially as specified, by which method of fulling 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 D. N. Force 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. Sercpyan, of New York City, assignor to Wm. Cousland, of New York City and J. D. 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 slitting 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. Spering, J. H. Ashmead and E. Hurlbut, of same place: I claim supporting the small bars or slender part of the tempered 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, Rokeby, O.: I claim uniting and adjusting the shank of the point D, to and with the shank of the coulter, E, by means of the head on said 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 and draw forward the heel of the rack or finger bar; thus relieving the great 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 continuing the shoe, H C, 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 and bars are elevated to pass over the cut grass, and the above parts 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 may be nearly horizontal in the line of draught and at any convenient hight, 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 of finger bar, D, in its position at the side of 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 and finger bar to avoid clogging or lodging of the mown or falling grass against, when said parts 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—C. 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 channel round 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, P. 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.

MESSRS. 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 floating of solid metal upon the top of molten metal is not that the latter is of greater specific 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 ninty-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 decease 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 St. 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 siccative linseed oil and sulphur, called balm of sulphur, or of a mixture of sulphur with a quantity of siccative 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 siccative 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 siccative 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.

*Sulphurized 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.