RECENT AMERICAN INVENTIONS.

Furnace for Roasting Ores.—This furnace is more especially intended for desulphurizing and oxydizing or calcining iron pyrites, copper pyrites or other sulphurets, or for calcining other auriferous substances. The object of the invention is to apply the heat uniformly, or as nearly so as practicable, throughout the whole body of the material upon the sole, bottom or shelf of the furnace, and, while permiting the combustion of as great a portion as is desirable of the liberated sulphur, to prevent the combustion of a sufficient portion of it to produce such an intense heat as will cause the fusion or agglutination of the material. Invented by R. B. Norman, of Sacramento, Cal.

Pianoforte Action.—In all the best pianoforte actions there is what is variously known as the "repeating lever," "repeat spring," "repeating device," "repetition movement," &c., that is to say, a device or mechanism by which the hammer, after striking, is arrested in or brought to a position very near the string, and there so supported that, by a very slight rise of the playing end of the key the jack may be allowed to fall into its operative position. In the actions heretofore constructed this device or mechanism is commonly either carried by the jack or in some way connected therewith or dependent thereon for its operation. This invention consists in a mode of constructing and applying such device or mechanism by which it is made entirely independent of the jack, thereby not only making the said device or mechanism more free and yet more positive in its operations, but allowing the jack to operate with greater freedom and certainty, and giving a better "touch" to the action. Patented to Henry Steinway, Jr., of New York city.

Slide Oiler.—The object of this invention is to render self-lubricating the gibs and slides of steam engines or other machines having cross heads, or their equivalents, working in straight guides, and allow the oil employed in such lubrication to be used over and over again as long as may be desired, instead of of being thrown off from the slide and lost or wasted. It consists in the combination of a hollow gib or shoe and an oil reservoir at the bottom, or at each or either end of the slide, the said gib or shoe being constructed with suitable openings for the reception of oil from the reservoir or reservoirs and for the delivery of such oil upon the surface of the slide. Invented and patented by Tisdale Carpenter, of Providence, R. I.

Governor Connection.—This invention, by Tisdale Carpenter, of Providence, R. I., relates to the application of the governor to lengthen and shorten the arms of rocking levers by which the induction or cut-off valves are worked, and thereby to cause the said levers to be capable of receiving from the cam or other device employed to impart motion to it from the main shaft of the engine, a motion which is variable in such manner as to enable the valve to be closed at an earlier or later point in the stroke of the piston of the engine, as may be required to effect its proper regulation. It is more particularly applicable in connection with the compound cam and rocking levers which constitute part of the subject matter of Letters Patent, No. 222, granted to the same inventor, dated Jan. 29, 1861. It consists in a peculiar mode of effecting the connection between the regulator and the shifting portions of the rocking levers which provide for the lengthening and shortening of their arms, the object to be attained being to prevent any unsteadiness of the motion of the governors produced in the shifting of the aforesaid arms of the levers.

SCIENCE AND BALLOONING.—The British Scientific Association has decided to patronize balloons, and last year appointed a "Balloon Committee," with a grant of two hundred pounds! to carry out experiments with them. The first experiment, made about five weeks ago, proved a failure, because the balloon leaked, and after ascending about half a mile came down in a thick coppice, breaking the delicate machinery used for taking observations, and seriously frightening but not hurting the "intrepid aeronauts."

A STEEL-suspension bridge of 110 yards span is now undergoing test at Birkenhead, England. The steel used in it stood a test of 70 tuns per square inch of tensile strain.

Specific Heat and Chemical Combination.

At a late meeting of the London Chemical Society, a paper was communicated by Mr. J. Croll, on the above subject, of which the following is the substance :—

After alluding to the opinion generally held with reference to the specific heat of compounds, compared with that of their component elements, namely, that a diminution took place during combination unless the resulting compound was a fluid, in which case the specific heat was increased, he stated that he had found this was not correct; for that the specific heat of compound gases and liquids was generally less, and that of solids more, than that of their component elements. A table of the specific heat of different bodies had been drawn up, from which it appeared that out of 94 solid compounds, the specific heat of 66 had been increased, and of 28 diminished, by combination; out of 28 gases there was an increase with 6, and a decrease with 22; while, out of 33 liquids, there was an increase in 12, and a decrease in 21 cases. In 14 cases the specific heat increased during the passage of the substance from the gaseous to the liquid state, and it was reduced in 11 cases while changing from liquid to solid. From this it was probable that the increase in the specific heat of a compound solid body above that of its elements did not depend simply on its being solid, but, on the contrary, that it was solid because its specific heat exceeded that of its elements. The following considerations would perhaps throw some light on the subject :—When any substance is heated, part of the heat is expended in producing expansion, and the other part in raising the temperature, and the sum of these two is equal to the specific heat. If a gas confined under a constant pressure is heated, it will be found to have a greater specific heat than if its volume be constant, the reason being that in the former case some of the heat is absorbed in producing expansion; for the heat cannot do two things at the same time, and that which produces the expansion cannot affect the thermometer. When heat is applied to a mass of ice the temperature rises to 32° and then becomes stationary; this is the result of the difference in resistance that the heat experiences at the two outlets, the greatest amount passing to that at which there is least resistance; hence the molecular force of a solid body must diminish as the temperature rises; at 32° the molecular force of ice cannot overcome the repulsive force. On heating a gas there is no loss from molecular influences, but with a solid, part of the heat is taken up in producing molecular changes, and therefore the less heat a solid contains the more does it resemble a gas in this respect, the specific heat increasing with the rise of temperature, from which it follows that the higher the melting point of a solid the less is the specific heat, which is experimentally found to be the case. In those cases of combination in which a change of one of the elements from a solid to a fluid state, or the contrary, took place, a change in the specific heat of the resulting compound could be accounted for. On the whole it would appear that the changes in the specific heat of bodies that occurred during combination were due not only to chemical action, but also to molecular changes; the real specific heat of an atom remaining probably the same under all conditions.

NEWLY-made cast steel, which has been found unfit for forging, is rendered workable by long exposure to the air or running water. This fact is known to practical workers in steel, who frequently act upon it, but the reasons why such a change is produced in the nature of the steel is unknown. It is not held to be decarbonization of the metal, but molecular changes in the metal.

TERRIFIC ROCKETS.—Lieut. Samuel Parlby, of the Bengal Artillery, states that it is perfectly practicable to produce rockets of 1,000 lbs. weight which can be thrown with equal exactness as shells from mortars. One of these falling upon the deck of a ship, he says, would immediately destroy it. They have a rotary motion like rifle bullets.

PROFESSOR THOMSON, of Glasgow, celebrated for his great knowledge respecting the operations of electricity, states that he usually finds the atmospheric electricity within doors negative to that of the earth. The air out doors is generally positive.

The Lead and Lap of Slide Valves.

The lead of the valve is the amount of opening the valve presents for the admission of the steam, when the piston is just beginning its stroke. It is found expedient that the valve should have opened a little to admit steam on the reverse side of the piston before the stroke terminates, and the amount of this opening, which is given by turning the eccentric more or less round upon the shaft, is what is termed the lead.

The lap of the valve is an elongation of the valve face to a certain extent over the port, whereby the port is closed sooner than would otherwise be the case. This extension is chiefly effected at that part of the valve where the steam is admitted, or upon the steam side of the valve, as the technical phrase is; and the intent of the extension is to close the steam passage before the end of the stroke, whereby the engine is made to operate to a certain extent expansively. In some cases, however, there is also a certain amount of lap given to the eduction side, to prevent the eduction from being performed too soon when the lead is great; but in all cases there is far less lap on the eduction than on the steam side, very often there is none, and sometimes less than none, so that the valve is incapable of covering both the ports at once. The common stroke of the valve in rotative engines is twice the breadth of the port, and the length of the valve face will then be just the breadth of the port when there is lap on neither the steam nor eduction side. Whatever lap is therefore given makes the valve face just so much longer. In some engines, however, the stroke of the valve is a good deal more than twice the breadth of the port; and it is by the stroke of the valve that the amount of the lap is properly measurable.

Sowing Flax.

Flax is usually sown on land which was broken up from grass for a corn crop the preceding spring; but it may also be sown after a manured crop, though in this case the quality of the fiber will rarely be so fine as in the former case. The land should have been deeply ploughed in autumn, so as to secure a fine tilth. The seed, which should, if necessary, be carefully freed from the seeds of weeds by screening, is usually sown broadcast by the hand, and covered by harrowing with the grass-seed harrows and rolling; nine pecks is the usual quantity of seed for an acre. The flax crop in the North of Ireland, where markets for its sale exist, and where it is carefully cultivated and prepared for sale, is very remunerative, so much as £20 ($100) clear profit, over all expenses, rent of land included, being frequently realized. Unless under very careful management flax is, however, a most precarious crop; and, while, on the one hand, it may be the most valuable which the farmer can grow, on the other, it may be the most worthless. Hence the extension of its culture beyond the flax-growing districts should be cautiously undertaken; and hence, also, the reason for the very contradictory statements which one hears regarding the productiveness and value of the crop.

The above is from the *Irish Agricultural Review* and was intended for the sowing of the seed in April in that country; it will answer for May in our Eastern Middle and Western States, and in Canada.

Oak and Iron-clad Ships—Zincked Bolts.

In a verbal communication to the London Chemical Society, Dr. Crace Calvert stated that when iron is placed in contact with oak in vessels, the acid in the oak rusts the metal. The plan which has been adopted to prevent this action, in the English navy, is to place a layer of teak between the iron and the oak. This arrangement, however, did not prevent the corrosion of the bolts which were still exposed to the action of the gallic acid in the oak. To prevent this, it occurred to Dr. Calvert that if the bolts were galvanized they might resist the action of the acid. To test this he obtained a number of zincked bolts and allowed them to remain in contact with oak for a considerable period of time, when he found that the action of the acid was much slower than when the iron was not galvanized, and the iron was also protected from the action of fresh and salt water. From this experiment we conclude that all iron bolts employed for the fastenings of oak timbers in vessels should be galvanized.