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"BURNING" IRON CASTINGS.

The process known as "burning" iron castings together has long been practiced by mechanics. It often occurs that the too rapid cooling of one part of a casting causes an unequal shrinking of the mass, so that a tremendous strain is brought upon the weak parts. Corners of square surface-condensers, the inside angles of pillow blocks, cast in screw engine frames, the "gothic" arrangements sometimes perpetrated on the frames of land and marine engines are liable to the contingency specified.

The loss of an entire casting from the cause mentioned, many hundred dollars in value, may be and has been prevented by "burning." The process consists merely in pouring melted iron on to the fractured parts, placed in a mold or otherwise, as desired. When they attain the same heat as the liquid metal fusion occurs at the points attacked, and the metal continues increasing in size until the operation is discontinued. Of course, a shapeless excrescence is formed outside, but this is readily trimmed off. Although not as sound as the body metal, it is still very strong.

We have seen hangers for shafting and spur-gear bearings mended in this way, and they afterward broke in an entirely new place; where the sound iron was.

An account of mending heavy cast-iron rolls for rolling mills by this process is thus described by a French work—the *Annales des Mines*—which says:—

"Meugy witnessed the reparation of a roll, of which a neck and one groove had been broken off in rolling. The roll was fixed vertically, with the broken end uppermost; and around this was a coke fire in a square grate containing about 100 kil. (about 2 cwts.) of coke. This preparatory heating lasted 1½ hour. At a given moment the grate was removed, the fuel quickly thrown upon the ground, and extinguished with water. The top of the roll being now red-hot, haste was made to surround it with a frame, which was rapidly and completely filled up with casting sand. After having levelled the sand and blown off the dirt from the end to be soldered, with a pair of bellows, a mold previously ready, and having within a cavity of the form of a sort of double truncated cone, of which the base was a little larger in diameter than that of the piece to be added, was placed on the top. In this mold was a tap or exit-hole, corresponding to an external groove leading to channels destined to receive the excess of pig-iron. By means of a crane a large pot, containing about 500 kil. or 600 kil. of molten pig-iron, was raised a little above the mold, and the metal poured in Scintillation occurred round the mold, and the pig-iron filled the external channels, where it solidified in the form of pigs. The head workman, who directed the operation, and who sounded every moment the surface of the piece to be soldered with an iron rod, ascertained when the surface of the roll began to melt; and when he thus found that the old pig-iron had liquefied to the thickness of about 0m03 (1·18 in.), which happened in four or five minutes, after pouring from 300 kil. to 400 kil. of pig-iron, he judged that it was time to stop the running of the metal from the mold. The tap hole was then stopped, and pig-iron allowed to flow in until the mold became filled. This done, a second mold, containing within a cylindrical cavity representing the neck of the roll, was placed, by means of a crane, on the other mold, the frame of both exactly fitting together in the usual manner. The joints being luted with a little clay, metal was poured afresh into the uppermost mold. At last a third mold, also cylindrical, was adjusted, and pig-iron poured in, which formed a dead-head subsequently to be removed. This head, by its pressure, consolidated the soldered joint by binding more intimately the new with the old pig-iron. It then only remained to allow the whole to cool, and, when cold, to turn the part in a soldered lathe.

The process should be rapidly performed, and ought not to last longer than a quarter of an hour, exclusive of the time needed for the preparatory heating in the coke fire. According to Meugy, a finished roll weighing 1,100 kil., cost 616f.; but, as old pig-iron was only worth 132f. the cost of reparation by this process amounted to 115·8f., so that there was a clear gain of 168f."

BREECH-LOADERS AT LAST.

A portion of our armies is to be supplied with breech-loading rifles at once, or at least as soon as the weapons can be manufactured. The Burnside Rifle Co., of Providence, R. I., have contracted to furnish 35,000 breech-loaders, of the Spencer pattern, and are now making extensive alterations of their works for the purpose of delivering them as soon as possible.

From the well-known efficiency of these weapons, and of good breech-loading small arms in general, we may look for excellent results. Although breech-loading artillery has never proved itself of much value small arms on the same principle have repeatedly given proof of their utility, and their story is well told by the terse telegraphic reports of correspondents, who give regiments armed with breech-loading weapons the credit of repulsing twice their numbers when assaulted, or of putting them to flight when acting on the offensive.

This action on the part of the Government in making this contract is highly commendable, but had it occurred earlier in the war we should have been spared many disasters.

The English Government has taken a contrary course. Recognizing the efficiency of the breech-loading principle it has issued orders, through Lord De Grey, for proposals to alter the Enfield rifle into a breech-loading weapon, at an expense not to exceed $5 per gun. The Enfield rifle is the Springfield rifled musket we use, and the result will probably be to spoil both weapons—to ruin a good rifle and make a poor breech-loader. Our Government has taken the wisest course and are on the safe side, for the record of the Spencer rifle is already made, and, not to perpetrate a witticism, will now be repeated.

CONDENSATION OF STEAM IN LONG PIPES.

Some information, exceedingly interesting to engineers, has recently been made public in an account of a subterranean engine erected in the celebrated "Gould and Curry" mine, California. The engine is 50 horse-power, and is 201 feet below the surface of the ground. The article is extracted from a journal published in the vicinity of the mine, and can be found in another part of this number. Those interested will note the amount of the loss of pressure from condensation in the two steam pipes mentioned therein. Where the Gould and Curry pipe was packed with ashes it lost but five pounds in going 1,100 feet; whereas in the straw-jacketed pipe, at the New Almaden mines, the steam lost 14 pounds in going only 1,300 feet.

There would seem to be a much greater gain from preventing radiation by packing the ashes loosely around the pipe. Dr. William Charles Wells in his work on "Dew," states that it is first apparent on wool, and similar filamentous substances. From this we might argue that the heat from the earth is cut off from them; that they remain cold, and are consequently good non-conductors.

The greatest neglect is apparent in carrying steam pipes to a distance. In many cases they are not even covered with canvass, but are exposed to all sorts of atmospheric influences. Such practices are deliberate and wilful extravagances, for which there is no excuse whatever.

THE LONDON "TIMES" ON THE TENNESSEE.

On another page will be found an article on the battle in Mobile Bay from the London *Times*. It is marked by the sonorous pomp characteristic of that paper, ludicrously contrasted with an inaccuracy of statement perhaps not less characteristic. The "Thunderer" gravely informs its readers that the inclination of the *Tennessee's* armor plates at an angle of 45 degrees would not materially affect their power of resisting the impact of shot, and that this surprising fact has been proved by the English experiments in gunnery.

We place very great value on experiments, but if it is stated that two and two make five, or that somebody has measured the three angles of a triangle and found that they are not equal to two right angles, we should refuse to believe the statement, even if made on a great deal better authority than that of the London *Times*.

Some respectable engineers have doubted whether inclined armor offered any greater resistance than the same aggregate weight in a vertical position. Even if this view is correct, 6 inches at an angle of 45 degrees would be equivalent to 8½ inches in a vertical position. Has the *Times* any record of an 8½-inch target, made up even of 2-inch plates, having been penetrated by cannon shot?

But against spherical shot there is no doubt that the inclination of the armor increases the power of resistance in a ratio much greater than that of the increase of weight. In his "Notes on Sea-Coast Defence," published in 1861, Major Barnard advocates the use of 15-inch guns, but admits that against armor inclined at an angle of 45 degrees their penetrating power would be lost. After proving by a geometric demonstration of the decomposition of the force that the penetrating power would be just half, and that this would be still further diminished by distribution, he says:—"In short, with an angle of incidence of 45 degrees the power of penetration of the ball would be wholly lost; that of smashing the bulwark reduced to considerably below one-half. If, therefore, we throw at these inclined sides a projectile of such magnitude that its living force is more than double—say four times—that which experience shows to be sufficient to break down a vertical bulwark, we may expect to accomplish the object."

It will be perceived that the whole argument of the *Times* rests on this absurd position, that the inclination of the armor of the *Tennessee* had no material effect in increasing the power of resistance.

CONDENSED MILK.

Most of our city readers have seen this article retailed from carts at their doors. In appearance it is a thick creamy-looking substance, of the consistency of molasses, which is afterward reduced to suitable thinness by the addition of water. The advantages derived from condensing the milk are that it keeps sweet much longer, and is perfectly pure. This last is not the least desirable quality, for the consumer adds as much or as little water as he chooses. We have used this milk in our family in large quantities for a number of years, and find it a very great convenience as well as luxury. For coffee it is far superior to common milk, and for young children, suffering with complaints incident to them, this condensed milk is invaluable in respect of purity; swill-fed, or otherwise impure milk, is the last thing to give a sickly, teething child.

The *New York Observer* contains an account of

the process of making condensed milk at Gail Borden's factory, which is the one alluded to by us, and for which Mr. Borden obtained a patent through this office several years ago:—

"The farmers bring their milk daily; it is poured into an immense boiler, the superfluous parts driven off, and the condensation effected in a few hours. The details of the process are exceedingly curious and worth studying. Everything is conducted with such scrupulous regard to cleanliness, that the result is irreproachable. Even the large cans, in which the farmers bring their milk, are cleansed by steam before they go back. This prepared milk is sold daily in New York from door to door, as any other milk is, but its chief market is in the army, where it is a great blessing as you will readily believe.

"The same process is applied to the juice of apples, and other fruits, and meat. Coffee is condensed in the same way. Indeed any article of food may be condensed by this summary operation, be reduced in bulk, with all its nutritious qualities preserved, and packed so as to be preserved fresh any length of time. To make the little cans, holding a pound each, a tin shop is at work constantly, and the workers are women exclusively. They are chiefly American girls, from eighteen to twenty years old, and as the machinery is driven by water and steam power, they have no heavy work on hand, and the business is admirably fitted to them. They make more than a dollar a day easily, and the shop makes about 3,000 cans daily. A carpenter's shop makes the packing boxes, and so the entire work, from receiving the milk to sending it off, is done in the factory, and this stands on the edge of the railroad at the depot, so that all labor of transporting is saved. My visit to this establishment was very interesting and impressive, for I do not recollect ever seeing a factory where so much order, cleanliness, and comfort were combined in a production so purely beneficial as this. It is the perfection of the art of condensing.

"Mr. Borden can condense 12,000 quarts of milk daily at this factory, and 20,000 in another at Brewster's station on the Harlem Railroad below, and there are four or five others in operation: one at Winsted, Conn.; one at York, Pa.; one at Livermore Falls, Maine; and two in Massachusetts. They will doubtless become more and more numerous as their great advantages and profits become known."

The British Association on the Metrical System.

At the recent meeting of the British Association at Bath, in Section F (Economic Science and Statistics), Mr. James Heywood brought forward the Report of the Committee on Uniformity of Weights and Measures, which recommended—

1. That it is desirable, in the interests of science, to adopt a decimal system of weights and measures.

2. That in furtherance of this proposal it is desirable, from its scientific capabilities, to adopt the metric system.

3. That as the weights and measures of this country are gradually undergoing a process of decimalization, it would be more advantageous, instead of drifting by degrees into a heterogeneous variety of systems, to change at once to a really convenient system

4. That it be recommended to the Government, in all cases in which statistical documents issued by them relate to questions of international interest, to give the metric equivalents to English weights and measures.

5. That in communications respecting weights and measures presented to foreign countries which have adopted the metric system, equivalents in the metric system be given for the ordinary English expressions for length, capacity, bulk, and weight.

6. That it be recommended to the authors of scientific communications, in all cases where the expense or labor involved would not be too great, to give the metric equivalents of the weights and measures mentioned.

7. That the influence of the British Association would be beneficially exerted in obtaining from Paris an authorized set of metric weights and measures, to be placed in some public and frequented building in London.

8. That advantage will be derived from the recent publication of metric tables, by Mr. C. H. Dowling, C.E., in which British standard weights and measures are compared with those of the metric system. That treatises explaining the metric system, with diagrams, should be forthwith laid before the public. That works on arithmetic should contain metric tables of weights and measures, with suitable exercises on those tables; and that inspectors of schools should examine candidates for pupil-teachers in the metric system.

9. On the subject of temperature, it is recommended that the authors of reports to be presented to the British Association relative to temperature be requested to give the degrees of heat or cold according to both the Centigrade and Fahrenheit thermometers.

10. It is recommended that the scales of thermometers constructed for scientific purposes be divided both according to the Centigrade and Fahrenheit scales, and that barometric scales be divided into fractions of the meter, as well as into those of the foot and inch.

11. That a committee on uniformity of weights and measures be reappointed.

The report referred to the history of the movement in favor of metrical weights and measures, and pointed out the advantages that would result from the adoption of a uniform system. Professors Williamson, Levi, Miller, and Daubeny, Sir B. Brodie, Sir William Armstrong, the Bishop of Natal, Captain Maury, and other great authorities upon weights and measures, warmly supported the report.

Straight Edges and Flat Surfaces.

At the recent meeting of the British Association in the Mechanical Section, Mr. James Williams read a paper on the "Flexibility of Iron," from which we extract the following interesting passage:—

"It is a common saying 'rigid as a bar of iron,' and but few persons are aware how very flexible iron, as well as other metal is. Many builders in introducing cast and wrought girders, or beams to support enormous weights, are of opinion that such beams are strong enough to what they call 'bear any weight without bending,' and are much surprised to be told by a mechanician that these same girders, however stiff they may appear, will not even bear their own weight without considerable deflexion. Many good working mechanicians even are quite unaware of the extreme subtlety of the metal they are operating on. It is only that class of mechanics who are engaged in scraping up valve faces, slide lathes, and similar tools, and, above all, attempting to make 'flat surfaces' and 'straight edges,' that can comprehend in a fair way the trying difficulty of keeping such works true after they have once got them so. In the engineers' workshop, where straight bars of metal are used for the purpose of testing the work under process of manufacture, it is necessary to keep at least three bars or surfaces of each kind for the purpose of testing each other, for it has often been known that a straight edge, got up with all the care and accuracy possible, true to-day will be bent to-morrow; indeed, the very handling of it while in use is quite sufficient to distort to such a degree that the workman frequently has to put it by awhile until it comes to the natural temperature of the room he works in, the partial heat of the hands alone being sufficient to render it useless for its object. In getting up straight edges and flat surfaces, if two only are used to test each other, it is all but a certainty that one will be hollow and the other rounding, but by using three we are enabled to discover this defect."

RECENT AMERICAN PATENTS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week; the claims may be found in the official list:—

Coffee Roaster.—This invention consists in the employment of a cylinder which rotates on friction wheels by means of flanges projecting from one or both its ends, and which is provided with a stationary feed box at one end, and with a rotary slide or other suitable gate opening at the opposite end in such a manner that the coffee can be introduced into the cylinder and discharged therefrom without stopping its motion or removing it from its bearings and that by this arrangement cylinders of much larger caliber can be used and much more work can be accomplished than by the ordinary method of hanging, changing and discharging the roasting cylinders. The interior of the cylinder is occupied by double spiral flanges, one inside the other and running in opposite directions, in such a manner that, by the action of one flange the beans are propelled towards one end, and by the action of the other flange towards the opposite end of the cylinder, and the beans are made to travel back and forth through the cylinder without reversing the motion of the same. Jabez Burns, of 269 Washington street, New York city, is the inventor.

Device for Turning-in Dead-eyes.—This invention relates to a new and useful implement for adjusting or fitting the ropes of shrouding in the grooves of dead-eyes, and which is technically termed turning-in dead-eyes. The object of the invention is to obtain a device by which the work can be accomplished with great facility and in a much more thorough way than hitherto, the ropes being fitted around the dead-eyes in a more compact and snug manner. William A. Overton, New York city, is the inventor.

Bolt-cutting Machine.—This invention consists in a ring having eccentric recesses or ways and provided with ribs to connect with the dies, said ribs and ways being made to expand in the direction in which the machine revolves in combination with a spring, stationary flange index plate and brake or friction clutch in such a manner that by applying the brake to the circumference of the ring the dies are instantly expanded, which allows of the bolt being withdrawn without stopping or reversing the machine. By changing the position of the index plate in relation to the stationary flange, the size of the opening in the dies can be adjusted to compensate for wear in the dies. J. A. Merriman, of Chicago, Ill., is the inventor.

Sugar Pan.—This invention relates to a certain improvement in that class of sugar pans in which the three compartments of the pan are separated one from the other by transverse partitions and placed at different levels so that the juice from the first compartment runs down to the second, and from the second to the third or finishing pan. Each of the two first pans is provided with a deep gutter or depression close in front of the partition separating said compartment or pan from the next succeeding one, and the opening or gates leading from one pan to the next are placed at such a hight above the bottoms of said gutters that by opening the gates the sediment is retained and the clear juice or sirup is allowed to pass from one pan to the other. In order to retain the scum each gate-opening is furnished with a movable box strainer which can be readily inserted before the gate is thrown open.—H. F. Bartlett, of La Grange, Mo., is the inventor.

SPECIAL NOTICE.

J. STUART GWYNNE, of New York City, has petitioned for the extension of a patent granted to him on Jan. 14, 1851, for an improvement in rotary pumps.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, Dec. 26, 1864.

HENRY RUTTAN, of Coburg, C. W., has petitioned for the extension of a patent granted to him on Jan. 31, 1851, for an improvement in ventilating furnaces.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, Jan. 16, 1866.

All persons interested are required to appear and show cause why said petition should not be granted. Persons opposing the extension are required to file their testimony in writing, at least twenty days before the final hearing.