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Contents:

(Illustrations are indicated by an asterisk.)

"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