ECONOMY OF ANTHRACITE COAL FOR LOCOMOTIVES.

For a number of years past all the heavy transportation on the Philadelphia and Reading Railroad has been performed by engines using anthracite fuel, and they have proved much superior in economy to those of their class burning wood. The chief characteristics of these engines are a large, wide and shallow fire-box; hollow wrought iron tubes for grate bars, through which the water circulates, communicating with the fire-box and the boiler. A variable exhaust is used, but in other respects the engines differ little from ordinary locomotives. The dimensions of the *Black Diamond*, one of the most approved of these engines (as described in the Pottsville *Miner's Journal*), are as follows:—Weight in running order, with fuel and water, 63,700 pounds; 8 drivers, each 43 inches diameter; boiler, 40 inches diameter, and 24 feet 6 inches long from end to end, including fire and smoke boxes; cylinders, 18 by 22 inches; 119 tubes, 2 inches diameter and 14 feet 10 inches long; fire box inside, 65 inches long by 72 inches wide, and 53 inches deep at tube sheet end, sloping to 46 inches deep at fire doors; 16 tubular grate bars, 5 feet 5 inches long and 2 inches outer diameter. This locomotive will haul as her regular load 110 loaded coal cars, weighing, exclusive of engine or double tenders, 910 tuns of 2,000 pounds, at a speed of 8 miles per hour, consuming in the trip of 95 miles, with such a train, about 10,000 pounds of anthracite coal. In this 95 miles is a fall of 620 feet, with several levels, one of which is over 8 miles long. The whole cost of this coal in the tender is $10; while to obtain the same results from an engine burning wood, about 6¾ cords would be required, costing us $26.50 when prepared for use. In addition to this, about 1¼ cents per mile (total, $1.42) are added for extra repairs to the coal-burner.

On this railroad there are also five first-class passenger engines which burn this fuel. The following are the dimensions of the *Hiawatha*, one of the most approved:—Total weight, fuel and water, 56,448 pounds; on her 4 drivers, each 67½ inches diameter, 33,264 pounds; cylinders, 15 by 20 inches; boiler, 40 inches diameter and 21 feet 4 inches long, out to out; 170 tubes, 11 feet 5 inches long and 1¾ inches outer diameter; fire-box, 84 inches long, 42 wide, and 46 inches high at forward end, sloping to 32 inches at fire-doors; 12 fire grate tubes, each 7 feet long, and 2 inches outer diameter; 4 truck wheels, each 30 inches diameter. The *Hiawatha* will take 6 eight-wheeled passenger cars, weighing with their contents 72 tuns of 2,000 pounds, from Pottsville to Philadelphia, 93 miles, at a speed of 30 miles per hour, with a consumption of 2,350 pounds of coal; and uses about 300 pounds more coal, with the same train, on her return trip. Fall between Pottsville and Philadelphia, 559 feet. Whole length of trip (including 23 stops), 4 hours 20 minutes. In performing the same duty a wood-burning locomotive would use from 1¾ to 2 cords of wood, the relative value of each description of fuel being the same as stated of the *Black Diamond*, and the additional cost of repairs, about one cent per mile more than if burning wood. These coal engines were designed and built at the Reading workshops of the company, by Mr. James Mulholland, the master machinist.

With proper management, the same coal fire can be carried without being being raked out or re-made, during a trip of eighteen or more hours; and in an emergency, it is not uncommon for the same engine to turn, and after some cleaning and raking of her fire, perform double duty, or a round trip of 190 miles, with full trains each way.

These locomotives haul trains of unusual length and weight, both of passenger and freight, at the allotted time table speeds, and can stand with the same fire for hours together in case of accident, ready to resume their trips when required.

WHITE ENAMELED CAST IRON WARE.

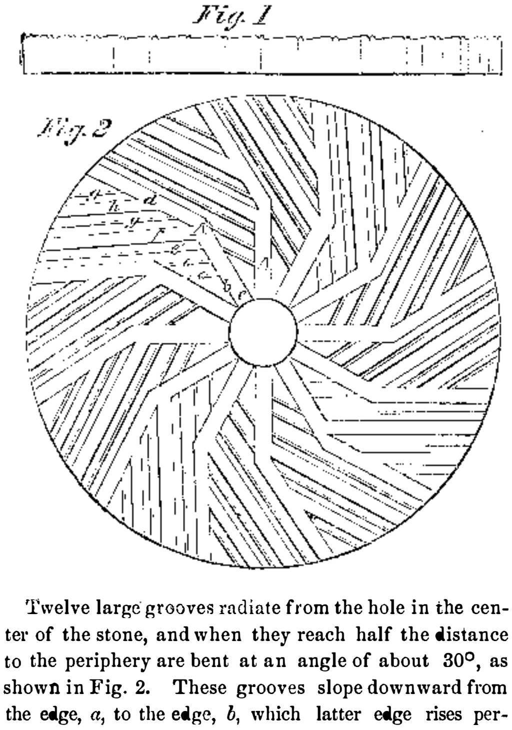
The latest information from the iron works on the Hartz says that the white enamel in cast iron vessels used at that place is prepared from artificial sulphate of baryta, without any addition of tin or lead. This is a great improvement on those valuable utensils for household use; not only because the objection to the poisonous metal (lead) is removed, but also because the baryta-enamel is far more durable and unchangeable. The reason for this is a chemical fact, namely, the sulphate of baryta is a compound of one of the strongest acids, and is not decomposed by other acids. Hence, an enamel prepared from it remains unaffected in contact with vinegar, acidulous fruit, and so on, even upon continued boiling; the glossy cover does not become dull and rough, but remains white and perfectly smooth. In this it differs very strongly from a lead enamel. The metallic oxyd is not rendered powerless, as the baryta is, but it can freely follow its chemical affinities. Hence the use of a lead compound for such a purpose is reprehensible, the more so as the enamel, when once attacked and laid open, offers still better points for corrosion to a great variety of substances.

Enameled cast iron kettles for the laboratory and kitchen (in the latter especially for making preserves) have of late years come into very general use. The objection to them, which relates to the poisonous nature of the protecting cover, is now completely removed, or will be when those with lead or tin enamel at present in the market are suffered to be withdrawn. Let every lady of the house take the precaution, when she buys an enameled kettle, to test the enamel by means of some acid—the one nearest at hand will answer. Dip a small piece of cotton or linen in a solution of oxalic, tartaric, or any other acid, and place it on the smooth enamel for 24 hours. If, after that, the spot is ever so little roughened or affected, reject the article. Such kettles, however, will not bear to be handled like one of copper or tin, as the inside is of glass, and once cracked it is unfit for use.—*Druggist's Circular.*

YARBROUGH'S IMPROVEMENT IN DRESSING MILLSTONES.

There are two principal objects to be kept in view in arranging the grooves in dressing millstones; first to make the grooves deep, so that they will not be worn out too readily; and second, to cut them in such relations to each other that the kernel of grain cannot escape before it is completely ground. The mode in which both these objects are obtained in the invention here illustrated will be understood by examining the cut.

Fig. 1



Twelve large grooves radiate from the hole in the center of the stone, and when they reach half the distance to the periphery are bent at an angle of about 30°, as shown in Fig. 2. These grooves slope downward from the edge, *a*, to the edge, *b*, which latter edge rises perpendicularly, forming the principal cutting edge. From groove, A′, are two two grooves of similar form, *f* and *h*, parallel with the branch, *d*, of groove, A. Small grooves, *e′* and *g g*, of similar form to the large grooves, but shallower, extend from groove, A, parallel with grooves, *f* and *h*, to the circumference of the stone, and two similar grooves, *e e*, parallel with these, connect the grooves, A and A′, with each other. The other twelve grooves, with their branches, are constructed precisely like groove A′, and in the same relation to the next preceding groove that A′ bears to A.

It is alleged that "by this arrangement of the grooves each kernel is crushed before it passes from the radial to the outer branch of the main grooves; the kernels being spread over the whole surface of the stone by means of the large grooves, *f* and *h*, no part of it is allowed to escape before it is crushed into flour or meal. The small grooves increase the cutting effect of the surfaces, and also prevent a burning of the flour."

The patent for this invention was obtained, through the Scientific American Patent Agency, Jan. 24, 1860, and persons desiring further information in relation to it will please address the inventor, Joseph Yarbrough, at Milton, N. C.

BELTS FOR DRIVING MACHINERY—WHICH SIDE IS BEST?

This is an important subject, because there is such a vast expenditure incurred annually for belts in driving machinery. The information which we have already published upon it (on page 150 of the present volume of the SCIENTIFIC AMERICAN) and also that which we now publish, is valuable to every mill-owner, and machinist, and will be useful a century hence, because it is derived from experience. It has been stated—and it is pretty generally admitted—that leather belts placed with the *grain* side next the pulleys will carry more power; but in connection with this, another question arises, namely, "which side placed next the pulley is most durable?" The following letter seems to be a pretty conclusive answer to this interrogation.

MESSRS. EDITORS:—On page 150 of the present volume of the SCIENTIFIC AMERICAN, I saw an article on belts and pulleys in driving machinery, and the remarks on the subject, although reasonable and instructive, suggest some comments which I take the liberty of presenting to you. Your Troy correspondent says: "I have found that it makes considerable difference in the power transmitted, according to which side of the belt is placed next to the pulleys. I was one of those who did as my father did before me, and so I run belts with the rougher side next the pulleys, thinking that they would 'hug tighter,' to use a common phrase" &c. Now, there is room for difference of opinion on this point, and my experience (of over twenty years) has taught me some facts. I have run the smooth or hair side next the pulley, but dropped it for the following reasons. Every one knows that the strength of belt leather lies on the hair side, and that also in about one-fourth of the thickness of it, and all know that belts will wear out, and that when about one-fourth is worn, the belt is not worth a straw. I now use the flesh or rough side next to the pulleys, and treat it as follows: I run it free from doing any work, if possible—but it makes but little difference—and give it a good coat of tanner's dubbing on the inside or working side. I repeat this two or three times in as many days, and the pores of the leather, from the effects of the softening influence of the application, become filled, and the inside or rough side becomes as smooth as the outside. The smooth and strongest side of the leather is now preserved, and my experience has taught me that it will last six times longer than by your correspondent's plan. The belt that drives our establishment was originally a 10-inch leather belt, but is now stretched to about nine. The dubbing put on it at first—about three years ago—made it as soft and pliable as I wanted it. It transmitted the power of a 10 by 20-inch engine to its full power, at 70 lbs. to the square inch; the tight or working side of the belt being under, and the slack side on top; a 36-inch iron pulley on the engine driving a 36-inch one on line shaft, the slack side will sag 10 inches, and even one foot if doing full duty, and it never slips; it would pull down the shafting first.

This is my experience of twenty years with belts, and when I have treated my leather in the same manner, the same results have always been secured.

The above-named belt has not been touched except to re-lace it (when broken), for the past three years, and it has been running almost every day since it started.

I would be in favor of putting the smooth surface of belts next the pulleys, were it not that they are much more durable when the strong side is kept from wearing.

T. McG. Jr.

Novelty Works, Dayton, Ohio, March 10, 1860.

In connection with the above subject the following letter forms an appropriate and useful appendix.

MESSRS. EDITORS:—Having noticed in a late number of the SCIENTIFIC AMERICAN (page 150) a very useful table on the power of belts, I send you two very simple and concise rules for finding both the power and the width of belts, which may be useful to many of your readers

Rule 1. To find the power of a belt: The width in