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## THE COMBUSTION OF COAL---ECONOMY IN FUEL.

It is unpleasant to see the waste so generally practiced in regard to that high priced necessity, fuel. Our people for generations have used wood as a fuel. Coal, although extensively used, is comparatively a new substance, and hundreds of families who burn it, know but little practically, and understand less chemically, of its properties. It is simply a condensed carbon—condensed as compared with wood—capable of generating an intense heat when properly managed, and liable to disappoint the housewife when not properly managed. It requires a large amount of oxygen to produce perfect combustion, and as we have no ready means of producing this gas in our dwellings, apart from its natural admixture with the other gases which make up the volume of the atmosphere, we must use that atmosphere as a means of combustion.

But some, in the management of their fires, seem to suppose that an addition of fuel will insure an increased combustion, and develop an additional degree of heat. No idea can be more mistaken. Coal, and especially anthracite coal, should be always furnished with a sufficient amount of oxygen to keep the fire bright. It is only smothering and retarding the fire to put in a thick layer of coal, or, as some do, fill the fire box, from a layer of two inches of ignited coal, to its utmost capacity, with fresh fuel. The consequence is, that for a time the fire is choked; until the heat of the lighted or igneous mass has received sufficient vitality from the admission of air to impart a portion of its heat to the new coal.

Evidently, then, it is important in the management of coal fires that oxygen, sufficient to produce combustion, should combine with the carbon; but, as we cannot, except in a limited way, regulate the admission of oxygen, the element of combustion, or, at least, we cannot increase or diminish the amount contained in a certain volume of atmospheric air, it is requisite that we should do the next best thing; gage the amount of fuel subjected to the action of the atmosphere. No more coal should be put upon a fire at one time than will readily ignite and give off a pure white blaze—not a blue flame, which denotes the presence of unconsumed gases—and that the fire should be undisturbed on the top.

This is an important element in the management of coal fires. "Jack Downing" once said, in his celebrated letters, that a coal fire was like a politician, "poke him on the top, his popularity, and he went down. Punch him at the bottom, his character, and he went up." The trouble with some of our politicians now is, that they have so little bottom or character, that if poked they go out, like an insufficiently attended coal fire.

In clearing the grate in the morning there is a quantity of unburned coal, which has been externally subjected to combustion. It is covered with ash, and looks to the inexperienced eye like cinder. It is often relentlessly dumped into the ash box. The fact, in many cases, is, that the lump is only roasted on the outside, not even coked, and is in a better condition for igniting than the green coal. We have stated that coal is a *condensed* form of carbon. The superficially burned lumps found in our grates or among our ashes, sufficiently prove this. But take a lump of anthracite coal from the fire, red hot and all alive. Throw it into water until the ashes are washed from it, and it is black externally, and cool. Take it out and break it open with a hammer and you will find it red hot and glowing inside. This shows that time and a plentiful supply of air are necessary to burn coal, and that large amounts of what we call ashes and cinders are really excellent fuel.

To prove this fact, let any one carefully sift his ashes, throwing out the inevitable slate, which can be readily detected, and start his coal fire on wood or charcoal, kindling his coal fire with the savings. He will find that he can get a good bed of incandescent coal sooner than with green coal on the kindlings. We have experimented with coal for twenty years, both in the house and under boiler, and we know whereof we speak. We shall allude to this subject again, taking up the burning of bituminous coals and the different plans of stoves and furnaces.

## MACHINERY VERSUS MANIPULATION.

Our mechanics are continually directing their endeavors to the object of making machinery do the work formerly accomplished by patient labor and skillful manipulation. Their success seems to be but an incentive to renewed effort in the same direction; for no sooner has one succeeded in making the automatic machine do a part of the work of the skilled mechanic, than he, or another, sets about an improvement, usually with success. The file, once a tool in constant requisition for almost every department of metal working, has been superseded by the planer, the shaping machine, and the milling tool. Indeed our founderymen and forgers have become so expert, that they turn out their work so that, in many instances, they leave very little, if any thing for the file to do. So with the cold chisel. Not half the work is done now with the chisel and hammer that was done in former years.

Machines are now in use, in all concerns of any magnitude, which were unthought of twenty years ago. Instead of a corps of old, experienced workmen, whose apprenticeship was a severe drudgery of many years, men are employed whose skill is confined mainly to the running of a machine—placing and adjusting the work and removing it when finished—while the machine itself performs the labor with remarkable rapidity and mathematical accuracy.

On a trip to Hartford, Conn., a few days ago, we were struck with the truth of the above considerations by a visit to the establishment of Messrs. Pratt, Whitney, & Co., who are widely and favorably known as the makers of superior machinist and gun tools. In their establishment—the main building of which is two hundred and fifty feet long, by fifty feet wide, and four stories high—are hundreds of almost self-operating machines, adapted to almost every detail of work, from the forging and casting to the final finishing. A modern machine shop seems like a miracle to one who remembers the experiences of twenty or twenty-five years ago. There is but little of the noise of hammering and the grating of files to be heard. Machinery, almost noiseless, untiringly shapes the thousand different forms, which, when "assembled," make the harmonious and complete whole.

Most of the forging is done by "drops" with dies which, at a blow, form the article desired. At this establishment we noticed a beautiful illustration of the value of this mode of forging. Messrs. P. W. & Co., are contractors for building the Weed Sewing Machine, which uses a shuttle. As our readers probably know, the sewing machine shuttle is a boat-shaped contrivance, about one and a quarter inches long, pointed at one end and blunt at the other. In the middle is a recess for holding the spool or bobbin. The ends of the shuttle are solid. The usual method of making the shuttle is to bend a piece of sheet steel to the form, and then forge the ends separately, which are afterward fitted and soldered in, the shuttle being, therefore, composed of three pieces. But at this establishment it is struck up from a bar of steel in one piece, the recess being formed perfect at one operation. While the cost of this important piece of the sewing machine is very much lessened, its durability is greatly increased.

Another device for saving manual labor is also worthy of notice. The various forged parts of the machines, whether of steel or iron, are subjected to immense pressure by an eccentric press, between two highly polished steel dies, which leave the surface perfectly smooth and susceptible of a high polish. They also condense the surfaces of the metal, making the article more durable and stronger. Whatever may be the form of the piece, dies may be adapted to it so that every portion of the surface can be acted upon. This saves the time and expense of milling.

The needles of the Weed Sewing Machine are straight, and at this establishment are swedged from the steel rod by power, instead of being turned, as is sometimes the case. Their strength and evenness of structure may be understood from an experiment which we witnessed. A machine was started, and, without stopping, sewed successively through sheet lead nearly one-eighth of an inch thick, the top of a cigar box, six thicknesses of pilot cloth, four of bleached cotton, fine muslin, dress silk, lace, and a piece of fractional currency, all without changing any part of the machine.

After witnessing the triumphs of ingenuity in adapting machines to the work of the human hand, one at first fears that the race of thorough mechanics will eventually become extinct; but further consideration shows the fallacy of this idea. Messrs. Pratt, Whitney, & Co., employ some of the best mechanical talent they can obtain. The perfection of the work requires it. The dies and swedges are made by experienced workmen, and finished only by the most patient and pains-taking effort. The gages, plugs, templets, and other tools required to insure perfect accuracy, demand the greatest judgment and skill. But in the inventor's department machinery can never intrude. It is but the creation of the brain of the mechanic. Here he reigns solitary and supreme. Machinery will continue to be his obedient servant, more and more valuable as it is more and more improved, but will never be his master.

### Mechanics' and Agricultural Fair.

We have received the prospectus of the first Fair of the Association of the State of Louisiana, which is announced to open in New Orleans Nov. 20th, to be continued eight days. Premiums to the amount of $20,000 are offered, and the other arrangements are projected upon a liberal scale. We notice among the premiums the offer of a gold medal and $250 for the best steam machine for making levees; also a gold medal and $200 for the best and most practical steam plow; a gold medal and $50 for the best reaper and mower combined. All necessary information can be obtained by addressing L. Homes, Mechanics' Institute, New Orleans.

FRUIT JAR.—There exists a very well-founded objection to the ordinary tin fruit can, with its soldered top. It is inconvenient, and not so neat in its appearance, as a nicely-fitted glass jar. John J. Squire, of New London, Conn., has recently secured a patent in this country and Great Britain for a glass jar which possesses excellent features. The top is firmly secured in its seat by an india-rubber band, and is quickly adjusted and easily removed, no sealing process being necessary