Steam Department.

METHODS OF SECURING "DRAUGHT."

By Geo. C. Robb.

IN order to burn fuel in a furnace, a sufficient quantity of air must be supplied to it. The quantity required varies with the quality and composition of the fuel. The supply of air should be continuous and evenly distributed among the fuel, so that the fire may burn with uniform intensity. Each kind of fuel used requires a special method of firing, and kind of grate in order that the best results may be obtained.

The one point proposed for consideration in this article, however, is not so much the treatment of the fuel, as the methods by which a current of air may be made to pass through the fuel.

The production of "draught," when by means of a chimney or high pipe, is said to be "natural draught"; when by means of some machine or mechanical contrivance, it is called "forced draught."

In some of the modern types of war vessels both means are combined, and the vessels are fitted with smoke pipes or funnels of sufficient size to make enough steam in the boilers for all ordinary purposes, but when more steam is needed for some extraordinary purpose, the stoke-hole hatches are closed and powerful fans are made to blow air down into the boiler room in such quantities as to raise the pressure above that of the atmosphere. By this means the fires burn more intensely and the men in charge are supplied with abundance of fresh air.

Forced draught may be produced in several ways, such as by a fan blowing air, or by a jet of steam inducing an air current,—the steam being used sometimes under the grate, and sometimes in the chimney. A fan drawing air out of the smoke pipe would produce an effect similar to the jet of steam, but as the parts of the fan would be exposed to the escaping heat, it is not a very practical method. In locomotives the draught is produced by a steam jet near the bottom of the smoke pipe, the steam used being the exhaust from the cylinders—hence the origin of the saying "the faster she goes, the harder she blows."

Some idea of the amount of draught thus produced may be formed from the statement that the power of a locomotive as used in England for passenger trains will run up as high as seven hundred horse power, and the coal used will be 3,000 pounds per hour. The smoke pipe from the boiler doing this amount of work is not over 13 feet high and 18 inches in diameter.

The locomotive gives the best results of any steam jet method of forcing draught. In portable engines for agricultural purposes, a similar method is used by many makers, but generally the results obtained are not as good as in locomotives. By far the most common way of obtaining draught is by means of a chimney; but though so commonly used, the reason of its producing "draught" and the natural laws which regulate its action are not so commonly understood. When a grate, covered with fuel closely packed, is supplied with air forced in by a fan, everyone at once recognizes the fact that power has been expended in order to supply the quantity of air needed in any given time; but when, by means of a chimney, the air is made to pass through the furnace, the work done is but seldom looked upon as power expended. Yet it is quite obvious that if it was power in the one case, it is power in the other, and the result obtained is precisely the same.

The draught of a chimney, then, is produced by expenditure of power. But how is the power obtained? What is its origin or source? A chimney is a vertical pipe in which the air is made to be of a higher temperature than the air outside the chimney. The outside air is therefore heavier than that inside, and as air may be termed an elastic fluid, the pressure of the atmosphere at once causes it to flow into the base of the chimney; or rather into every opening which may be in the chimney, where the outside pressure is greater than the inside. The draught is really produced, then, not so much by an up-current inside the chimney, as by a down-current on the outside. The inside should be kept hot—hence a brick chimney will produce a better draught from the same expenditure of heat, than can be got from an iron one. In arranging the furnace flues and connections from the boiler to the chimney, the fact that the air current is really forced from the outside towards the chimney, and not pulled as if it were a rope, should be kept in view.

When the air current is looked at in this light, it will be seen at once that in flues, all sharp turns should be avoided, and any bends made by easy curves. Sudden change in area should also be avoided, and as a general rule, the draught will be better if the area over bridge wall be less than area through the tubes or flues, and the chimney area be at least equal to the area through the tubes.

In cases where the fuel used packs closely, such as small coal and saw dust, a greater velocity of draught or rather force, will be needed. Height of chimney is essential for this as area is for quantity.

The difference between the quantity of air passing through a fire and the force or velocity with which it passes should be considered; and it is proposed to view the draught question from that standpoint and in relation to kind of fuel used in another article.

THE ADJUSTMENT OF CORLISS ENGINE VALVES.

THE following paper on the above subject was recently read before the Association of Stationary Engineers of this city by the vice-president, Mr. G. C. Mooring:

We will begin by taking off the caps, or back bonnets, when lines will be found as follows: For the steam ports, a line on the cylinder coinciding with that edge of the port towards the end of the cylinder; and a line on the back end of the valve coinciding with the edge of the valve towards the end of the cylinder. The lap movement of the steam valve is towards that end of the cylinder in which the valve is located. The exhaust valve covers or works over the opening in the valve chamber into the exhaust chest, and the opening edge is that side of the opening towards the center of the cylinder, the line on back end of exhaust valve showing its opening edge.

The wrist-plate is located central between the four ports on the front bonnet side of the cylinder, and has lines on the upper side of its hub, showing the extremes of travel and its center of motion.

To set the valves, place and hold the wrist plate on the center line, and by the adjusting rods for shortening and lengthening the valve connections, set the exhaust valves at the point of opening and lap the steam valves from 1/8 to 3/8 of an inch, according to the size of the engine—the less amount for an 8 inch cylinder, the larger amount for a 30 inch cylinder, and intermediate sizes in proportion. Connect the wrist-plate to the eccentric by the eccentric rod, and hook. With the eccentric loose on the shaft, roll it over and note if the wrist-plate vibrates to the mark of extreme travel. Adjust at the screw and socket in the eccentric rod to make it vibrate to the marks. Place crank on either dead centre, and roll the eccentric sufficiently more than one quarter of a revolution in advance of the crank (observing at this time which way you want the engine to run) to show an opening of the steam valve nearest the piston of from 1-32 to 1/8 of an inch, according to the speed the engine is to run. This port opening at the dead center is called "lead," and is for the purpose of making a cushion for the piston to rebound from or stop against; high speed engines require more lead than slow running engines, other things being equal. Tighten securely the screw in the eccentric, and turn the engine shaft over in the direction it is to run, noting if the other steam valve is set the same. If not, adjust by shortening or lengthening its connection.

To adjust the cam rods, place the govenor balls on the top motion pin; then move and hold the wrist-plate to one extreme of its throw, and adjust the cam rod for the steam valve. Open so as to bring the steel cam on the cam collar in contact with the circular limb of the cut-off hook. Move the wrist-plate to the other extreme of throw, and adjust the other cam rod in the same manner.

To test the correctness of the cut-off, block up the regulator to about its medium height, and with the eccentric connected to the wrist-plate, roll the engine shaft very slowly in the direction it is to run; and when the cut-off hook is detached by the cam, stop and measure the distance the cross-head has traveled, then continue the revolution of the shaft, and note if the other steam valve is cut off at an equal distance, traveled on the [illegible]es. If not, adjust the cut-off rods until the points of cut-off measure alike from each center.

The Ontario Oatmeal Millers' Association met in this city on the 13th of January, to consider what course to take in regard to advancing prices of oatmeal in view of a considerable rise which has lately taken place in the price of oats. It was decided to take no immediate action. If the price of oats continues to go up an increase in the price of meal will be necessary. The demand for rolled oats is reported to be increasing largely. This will probably tend to lessen the number of oatmeal mills throughout the country, many of which will close in preference to putting in new machinery.

THE NEW 1,000 BARREL FLOURING MILL AT KEEWATIN, ONT.

FROM the *Milling Engineer*, of Milwaukee, published by Messrs. Edw. P. Allis & Co., the well-known mill-furnishers, who had the contract for the erection of the new 1,000 barrel flouring mill for the Lake of the Woods Milling Co., at Keewatin Ont., we reproduce the following illustration and description of the new structure and the manner of its equipment:

Keewatin is situated on the shores of that beautiful sheet of water known as "the Lake of the Woods," and on the Winnipeg river. The lake itself is unsurpassed for beauty by any sheet of water in America, being studded with innumerable islands covered with pine. It presents the appearance, from a distance, of a heavy forest traversed by innumerable rivers. This lake is destined at no far distant time to become one of the most famous of America's summer resorts, and with the enterprise and push of the Canadian Pacific railway, which skirts the northern shore, nothing will be left undone that will add to the traveler's pleasure.

The natural distance from the level of the lake to the level of the river was seventeen feet and ten inches, but the engineers saw where they could add to the power and, by building a dam across the outlet of the lake, have raised the water four feet, making the fall twenty-one feet and ten inches. It is from this scource the power for the mill is obtained, having the lake and its tributaries for a feeder and the Winnipeg river to carry off the discharged water from the wheels, it gradually finding its way to Lake Winnipeg. The raceway for carrying the water from the lake to the wheels is a natural ravine, terminating about 150 feet from the shore of the lake. Through this granite bluff they had to blast an opening for the water to flow. On this bluff runs the Canadian Pacific railway. A bridge was constructed to span the race way of the plate girder type.

The wheel pit, as is clearly shown, is of granite, resting on a solid rock foundation. The depth of water below the wheels is eight feet, and there are arched openings on three sides of the wheel pit to allow the water to escape to the river. The walls of this wheel pit are eight feet and six inches thick at the bottom tapering to six feet thick where the sills of the wheel house rest on them. The floor on which the turbines set is of four inch plank supported on 16 x 16 inch timber, which are supported in the middle by sixteen six inch and two ten inch iron columns which rest on the solid rock.

The power is obtained from two sixty inch New American wheels, furnished by Wm. Kennedy, of Owen Sound, Ont., although the wheel pit was made large enough to accommodate four wheels. These wheels will develop 900 horse power with a twenty-two foot head and have a draft tube of sufficient length to allow the tubes to stand clear of the tail water and in no way obstruct it. The opening from the race way to the wheel pit is thirty feet wide and the race has an average depth of ten feet of water. At the head of the race are massive head gates built between solid granite walls with wing walls spreading out in both directions to insure free access of water to the race way.

The wheel house is two stories in height at the end next the mill, and one story high directly over the wheels, thus giving plenty of room to take out the wheels without moving any flooring. In the first story of the wheel house, which is 36 x 70 feet, is located the heavy gearing, which transmits the power to the mill, being eight feet in diameter, four inch pitch and sixteen inch face. These gears and shafts connected to them are carried on three heavy trusses, which span the wheel pit and are made of 16 x 16 inch timber. There is also on this floor the fire pump which has a capacity of 900 gallons per minute under a pressure of 150 pounds. This is obtained from a Fales & Jenks rotary pump, which is driven from the wheel driving the cleaners and elevators, and can be started at a second's notice. There is also the shafting operating the gates of the wheels. In the second story of the wheel house are located the two water wheel governors and an electric dynamo, of the Edison make, 125 lights capacity. The entire outside of the wheel house is covered with corrugated iron and has a flat tar and gravel roof.

Passing to the mill building, which is of native granite, quarried from an island in the Winnipeg a few yards from the mill, we find the building to be six stories high and standing, as shown by the engraving, on a bluff of granite, the surface of which has been blasted off in level steps to secure a solid foundation. The building is divided into three separate parts by heavy granite walls, the mill proper being 50 x 85 feet, with an addition of 25 x 50 feet on the east end, and separated by a three foot stone wall, for cleaners and feed department, dust