THE GAS PRODUCER FOR HEATING PROCESSES.

(*Continued from page 504.*)

this producer, the ashes being held in a large basin of water, which forms an effectual seal, preventing the generated gases from escaping. A steam blower creates an artificial draft for burning the coal, and at the same time sends in enough steam to enrich the gas, keep down the temperature of the fire, and soften the clinkers. The quantity of gas made is accurately controlled by the amount of steam turned on the blower.

On top of the producer is located a water-sealed automatic feed, for spreading the coal evenly and regularly over the entire burning area. Upon the continuous and accurate operation of this feed a large measure of the success of the producer depends.

It is obvious that if the fuel bed can always be kept in the same condition as regards temperature, depth and density, the gas produced will be constantly uniform. The paramount factors in maintaining uniform conditions in the fuel bed are first, the constant and even feeding in and spreading of the coal; second, the constant and even agitation of the fuel and ash bed; third, the constant and even removal of the ashes; and fourth, the even blowing of the entire fuel bed.

The quality of the gas, the perfection of the producer, and the economy of its operation depend almost entirely upon the degree of efficiency attained in these four operations.

With this end in view three at least of our leading manufacturers are spending considerable money in extensive experimenting. One of them is now offering a producer that, it is claimed, will perform all of these vital operations automatically and hence with a degree of perfection quite beyond anything heretofore obtained. In the ordinary old type of producer, the coal is hand fed and hand spread (if spread at all), the fuel and ash beds are hand poked every few hours (depending upon the faithfulness of the operator), the ashes are removed every 24 to 36 hours, and the blower hood is so designed as to make an even distribution of air throughout the producer impossible.

With our best producers, however, even though they are but partially automatic, great economies in numerous industries have been effected—the fuel bill often being cut down one-half and the capacity increased one-third.

How are such economies possible?

In the first place, in direct firing with solid fuel, combustion is always imperfect, often over fifty per cent of the energy of the coal passing up the chimney in the form of incompletely burned gas and heat to create the necessary draft. Accompanying this is the indrawing of a large excess of cold air through the grates, "to make the fire burn." Then there is a waste of coal through the grates with the ashes; the loss by radiation is very large, and finally, in applying the heat, it is usually impossible to distribute it to the exact places where required.

In the second place, the labor necessary for handling the coal at the various furnaces is a costly item.

In the third place, a direct coal fire is difficult to control; at times more heat will be produced than can be utilized, while at other times the heat will fall far short of the required amount.

Finally, whenever a plant is shut down, whether every night, only for an hour, or for a day or two, there is always a great waste in banking the fires and firing up again.

Contrast this with the conditions when a modern gas producer is used.

In the first place, in a properly-arranged gas furnace there is perfect combustion, so that small allowance need be made for loss of fuel value. This is a noteworthy fact, and calls for emphasis. All the coal put into a good gas producer is wholly converted into gas and ashes, so that all available heat in the coal is utilized, except a small radiation loss. Moreover, the air used for combustion is not cold, but is already raised to a high temperature by means of regenerators, which thus conserve nearly all of the otherwise wasted heat of the furnaces. In the case of melting furnaces, this feature alone means a saving of 50 per cent. There is, then, no loss of coal through the grates, and the heat lost by radiation from the producer and flues is a very small item. Moreover, the heat from the burning gas may be applied at the very point where needed.

In the second place, the coal is all received and handled at one point, thus greatly reducing the labor bill.

In the third place, a producer-gas fire is always under perfect control, allowing accurate regulation of the heat to meet the changing requirements of the furnace.

Finally, if the plant is shut down over night, or even over Sunday, there is practically no loss. It takes but a few minutes to get up the required amount of heat, even when the producer has been idle for two or three days.

But what are some of the figures gained by actual working experience?

In rolling mills with direct firing, about 300 pounds of coal per gross ton of finished product are required in the heating furnaces; with producer gas, only 122 to 150 pounds are needed.

In melting glass under the old method, one pound of coal was required for each pound of glass; with producer gas, the same results are obtained with one-half pound of coal per pound of glass.

Formerly, in steel works one ton of coal was consumed in melting one ton of iron, and 1,500 pounds of coal per ton of iron are still required with direct coal firing. With producer gas, but 600 to 800 pounds of coal per ton of iron are needed.

But fuel economy is not the only advantage to be derived from producer gas. Its use often greatly increases the output of a given plant, and provides facilities for accomplishing results that would be impossible with solid fuel.

A producer has recently been installed for lime burning, resulting in an increased capacity of 30 per cent and a decrease in the cost of fuel of 38 per cent.

The comparison of producer gas with other forms of fuel is easily made.

In the manufacture of illuminating gas, a large amount of waste is unavoidable, and it is necessary to make a certain proportion of by-product, or oil must be used for enrichment. This practically puts illuminating gas entirely out of consideration.

In the limited regions where natural gas is very cheap—say, 5¼ to 6½ cents per 1,000 feet—coal must be low in price—$0.75 to $1 per ton—in order that producer gas may successfully compete with natural gas. But since slack coal can be used advantageously in the best producers, it is not an impossible proposition even in the natural gas regions.

If oil and producer gas could be fired with equal economy, then oil at one cent a gallon would be as cheap a fuel as producer gas made from coal at $1 per ton; at $2 per ton for coal, the value of oil would be 1.7 cents per gallon. But oil, as a rule, cannot be fired with more than one-half the economy of producer gas; hence, producer gas made from coal at $2 per ton would be as economical as oil at one cent per gallon. The present price of fuel oil in the neighborhood of New York city is from 3 cents to 5 cents per gallon.

From these figures, the manufacturer can easily decide which fuel would be most economical for him in his locality.

The following is but a partial list of the many lines of business to which producer gas is being adapted with marked economy, and usually with largely increased capacities: Heating iron and steel in rolling mills and steel works of all descriptions; smelting and refining zinc, lead, copper, and all metalliferous ores; manufacturing lime, sewer pipe, pottery, brick, etc.; in chemical works, for heating the retorts, stills, roasting floors, boiling kettles, and evaporating pans; in enameling and japanning ovens, paint works, etc.; for heating and welding in locomotive works, boiler works, pipe mills, variety iron works, and railroad repair shops; in brass and copper mills, plate mills, malleable iron works; in spring works; in ore roasting and the manufacture of phosphates, soda ash, carbons, etc.; in sugar refineries, ship-building establishments, the manufacture of carriages, and the making of glass.

From a position of relative unimportance, the gas producer is thus being brought to a high state of efficiency, and shows itself to be of such value in so many lines of manufacture, that it would be hard to find a subject of wider or more practical interest.

The Current Supplement.

An article on the excavations of Delphi by the Paris correspondent of the SCIENTIFIC AMERICAN, splendidly illustrated, opens the current SUPPLEMENT, No. 1564. Among the articles of practical interest may be mentioned one on Amalgams; Their Composition, Properties, Preparation, and Uses, and another on Old-Fashioned Weather Glasses. John Richards' article on simple steam turbine engines is concluded. Louis A. Hicks writes instructively on reinforced concrete construction. Rough casting, or as it is sometimes called, slap-dashing, is made the subject of a good article. Despite the improvements made in recent years in apparatus for saving life and making respiration possible in mines and conflagrations in general, the number of lives saved by the use of such apparatus is lamentably small. A new type of respiration apparatus, which is supposed to overcome many of the difficulties experienced heretofore, is called the pneumatogen, which is the invention of mining experts. This apparatus is exhaustively described. S. F. Emmons continues his historical review of the theories of ore deposition. One of the most thorough tests of the Edison iron-nickel accumulator that has ever been made was conducted by the well-known electrical engineer M. U. Schoop. The results of his investigations are published, and constitute a most valuable contribution to the literature of the storage battery. The usual Science Notes and Trade Notes are also published.

Correspondence.

Observations of Sunspots.

To the Editor of the SCIENTIFIC AMERICAN:

In reference to your article about sunspots in a recent number of the SCIENTIFIC AMERICAN, the following may be of some interest.

On the afternoon of Sunday, November 12, I happened to notice the sun as it was gradually sinking behind a hill. It was just enough obscured in haze, so that I could look at it without inconvenience. As I looked, a scarcely visible speck in the red orb of the sun caught my eye. I thought it was a delusion, but as I scrutinized the sun for fully five minutes and the speck remained, I realized that this insignificant dot was an immense sunspot. It was oblong in shape and about in the center of the sun's disk.

I watched the sun with much interest until it disappeared, for, in all probability, I will never again see a sunspot with my naked eyes. IRWIN A. HALL.

Easthampton, Mass.

Preserve Niagara Falls.

To the Editor of the SCIENTIFIC AMERICAN:

I have just mailed a letter to our Congressman, Henry T. Rainey, urging him to give earnest aid to the restoration and preservation of Niagara Falls. Nothing would help more to convince the national Congress of the necessity of this work than a carefully and concisely prepared exhibit, showing the amount of water withdrawn from the Falls by the grants so far made.

Here in the West we believe that the power plants so far constructed should be condemned and settlement made with the corporations and after that Niagara River from Lake Erie to Ontario be converted into a public park for all time to come. Your articles published from time to time have been of great interest. Isn't it possible to prepare some sort of data covering this clearly and place it before each senator and representative? E. K. BLAIR.

Waverly, Ill., November 29, 1905.

Lubricating the Underwater Surface of Ships.

To the Editor of the SCIENTIFIC AMERICAN:

I would like a little space in your paper to put a few thoughts before those who may have an opportunity of testing them as to improvements in ships to make them get more quickly through the water. The friction between the sides of the ship and the sea must waste a great deal of power. The fish has a glutinous coating which I suppose lessens the clinging of the water to its surface. In many cases of friction the application of ball bearings reduces the power required otherwise to be used. An air bubble is a perfect sphere and if sufficient of them could be introduced at the lowest point upon the ship's surface they would act as friction rollers until the surface was reached.

It would be possible to use a pipe passing down the bow and along the keel, perforated with many holes, and supplied by a force pump with air. As the air escapes it will rise against the skin of the ship and follow to the surface, acting theoretically as friction rollers.

Or if a jet of kerosene oil was thus distributed it would kill the barnacles and growths that soon adhere to the iron, and make a coating that would answer for the fish's coat of slime. Two or three times a day would keep the surface oiled. D. B.

December 8, 1905.

A Panama Canal With Locks.

To the Editor of the SCIENTIFIC AMERICAN:

As another solution to the Panama Canal problem, I would suggest the following: First, build a lock canal; the locks to be built of steel, somewhat on the plan of a floating drydock, but having gates at each end. The under part of the locks to be caissons, such as used in bridge pier building. Thus, by using the well-known process of compressed air and undermining, the locks could be gradually sunk to sea level. Dredging could be carried on in all the different levels at the same time without interfering with traffic passing through the canal, the locks being removed as the different levels attain the desired depth. I should think locks 700 feet in length, 80 feet wide, and 65 feet in depth over the sill would accommodate the largest vessels that would probably pass through the canal before the sea-level depth was attained. I do not think such locks would be as expensive to construct as masonry ones would be, and after the completion of the canal they could be rebuilt into floating drydocks, or the material in them disposed of for other uses, thus saving a considerable expense.

By this plan, a lock canal could be built probably much quicker than by using masonry or concrete locks, and by the use of powerful dredges, its transition to a sea-level one would be a matter of both less time and expense than by some others proposed.

Indiana, Pa., November 25, 1905. EDWARD ROWE.