Engineering, Civil & Mechanical.

ECONOMY IN STEAM BOILER PRACTICE.

Our attention was lately called to some simple and novel appliances employed at the Brooklyn Oil Works, Hunter's Point, which are worthy of special notice from the convenience and the notable economy which they realize in practice. We refer specially to the tar burners used in connection with the Babcock & Wilcox boilers for burning the refuse tar of the stills, of which an abundance is made at the refinery in question, in place of coal. The attempt has frequently been made to devise a practical method of utilizing residual products of this kind at gas works, refineries of petroleum, and other industrial establishments; but thus far no remarkable success has attended these efforts. The method here referred to, however, gleaned from personal inspection, and from facts pertaining to the present cost of operating the boilers, appear to be convincing in establishing the practical success of the method of tar-burning there in operation.

The apparatus is the invention of Mr. H. E. Parson, Superintendent, and Mr. Geo. V. Northey, Engineer, of the Watertown Steam Blower Co., of Watertown, N. Y., (whose offices are at 42 Pine street, New York). This company make a speciality of various devices for utilizing waste products in all kinds of factories. They have a steam blower for burning the different varieties of slack coal, spent tan-bark, sawdust, screenings, peat, or any kind of tarry matter. This blower is used for forcing a blast under and through the grate bars, and as such has wonderful capacity. It is a power within itself, having no shafting, gearing or machinery, giving a blast sufficient for boilers varying from 3 to 200 horse-power, and being under perfect control.

The high heating power of some of the waste materials mentioned, and their low cost as compared with coal, makes the question of their employment as a substitute for the latter, one of special importance on economical grounds where circumstances place the material in quantity at disposition. As we have already stated, our comments in the present article will be confined to the tar burners, at the Brooklyn refinery, where they have been in use for the past 18 months for firing a set of four Babcock & Wilcox boilers, of 100 horse-power each, and with the result of having given complete satisfaction as to ease and reliability of operation, and of having demonstrated a notable economy. This make of boiler is peculiarly adapted to this fuel, by reason of the thin heating surface and absence of all joints in the fire, enabling it to withstand the very intense heat generated, under which ordinary shell boilers are rapidly destroyed.

Referring to the arrangement of the burners, the tar, which is sufficiently fluid for the purpose, is allowed to run down through a pipe provided for the purpose, from an elevated reservoir. At the proper point, the tar is met by a steam jet, by which it is atomized and carried with great energy into what corresponds to the ordinary fire space of the boiler. The energy of the impelling steam jet induces simultaneously the entrance of sufficient volumes of air through openings provided for the purpose, to allow for the combustion of the tar and the thorough intermixture of the combustible with the oxygen of the entering air, while the method secures a very perfect and intense combustion. Grate bars are, of course, unnecessary, and are dispensed with. The operation, as witnessed by us, was perfectly automatic, and appeared to require no special supervision, the supply of steam and the flow of tar simply requiring regulation from time to time, as more or less steam was needed, which was effected by the turning on or off a stop-cock controlling the supply of the one or the other. The action of the arrangement under the proper adjustment of parts is, therefore, perfectly regular and automatic. The tar is burned without a particle of smoke and with a very intense heat. No dust is produced—in fact, it is a perfect fire.

In considering the question of the economy of this arrangement, a notable element, aside from the prime question of the relative cost of coal and tar consumed per pound of water evaporated, is the material saving of labor in being able to dispense with the attendance to fires, removal of ashes, and other items of this kind which firing with coal demands, and which, where a number of large boilers are in constant operation day and night, as in the case here alluded to, is no inconsiderable one.

The best evidence of the economy of this method of firing, is afforded by the performance of the boilers. Fortunately for the correct estimate of this factor the superintendent of Brooklyn refinery, Mr. Haldebrandt, has kept an accurate register day by day of the amount of water evaporated and of the number of gallons of tar consumed, from which we are able to make a direct comparison with their performance with coal.

We give below the log of the attendant in charge of the boilers, for twenty-four hours, which we are informed represents an average daily performance: Tar consumed in 24 hours, 75 barrels, at $1 per bbl. = $75; water evaporated, 358,400 pounds. To estimate the evaporative value per pound of combustible, we may take 75 barrels of tar of 40 gallons each, equal to 3,000 gallons, which, at 7 pounds per gallon, would give the number of pounds of tar consumed, 21,000. The evaporation would therefore be

$$\left\{\frac{358400}{21000}\right\} = 17 \text{ pounds of water per pound of tar.}$$

This evaporative effect greatly exceeds that obtainable with coal, in addition to the very perfect combination which the blower insures, as before explained, the heating power of the tar is considerably greater than that of coal. A comparison of the above results with those obtainable with the use of coal as fuel, will be highly instructive, and is given in the following tabulation:

75 barrels tar, at $1 per bbl.....$75
To do the same work, would require on an average
20 tons of coal, at $4.50..... 90

20 tons of coal, at 2,240 lbs. = 44,800 lbs.) and the evaporation per pound of coal would be

$$\left\{\frac{358400}{44800}\right\} = 8 \text{ pounds.}$$

Evaporation per pound of tar = 17 pounds.

The effectiveness and economy of this method of firing seems, therefore to be fully demonstrated.

It may not be out of place to make an allusion to the boilers in connection with which the above described tar-burners have been so successfully applied. Many of our mechanical readers will recognize the Babcock & Wilcox boiler at once in the accompanying engravings; and the only essential modification adopted in employing the tar burners, consists in dispensing with the grate bars, and in providing suitable openings for the free entrance of air into the fire-space.

It will be unnecessary for us to dwell in this place upon the special peculiarities that have gained for this style of boiler a high reputation in respect to great economy and practical immunity against the danger of destructive explosion, since we have repeatedly presented these facts in detail. We will only add, in order to bring out in stronger contrast, the very high evaporative power developed by the use of tar in the Parson tar-burners at the Brooklyn refinery, the following records of the performance of the Babcock & Wilcox boiler, under strict test conditions. The evaporative duty shown in the following table will be at once recognized by steam users as being exceptionally good.

TESTS OF BABCOCK & WILCOX BOILERS.

—Water evaporated in lbs. from and at 212° Fah.—

	Per lb. of coal.	Per lb. of combustible.
At Centennial Exhibition.....	10.75	12.131
" Raritan Woolen Mills.....	9.798	11.227
" Harrison, Havemeyer & Co....	9.712	11.601
" T. A. Edison.....	9.4	11.365

THE works for the proposed tunnel from Dover to Calais have made such satisfactory progress, that its promotors—Colonel Beaumont, R.E., and Captain English R.E.—are now able to employ three shifts of men constantly throughout the twenty-four hours, and are sanguine of being able to bore about 30 ft. per day when all the machinery is perfected. At present two drills worked by engines driven by compressed air are at work, and about thirty laborers are employed. The bore is 7 ft. in diameter, and the soil chalk. It is so firm that the engineers are of opinion that no brick or cement work will be required to shore it up. Hitherto the difficulty they have had to contend with has arisen from the quantity of water which has found its way into the cutting, and which has been pumped up by means of a powerful engine placed at the mouth of the shaft leading into the tunnel. This shaft is about 300 ft. long, and the boring already accomplished upwards of 500 lt. A new shaft is being driven through Shakespeare's Cliff, which, when completed, will be about 200 ft. in depth, and this will enable several additional hands to be employed, and the work to progress much more rapidly than at present.