place, these products had been eroded by the rapid stream of water.

That the residual coatings afford no permanent protection to the iron is evidenced by the tuberculation which occurs in galvanized pipe after long use in rapid flow. A section of an 1½-inch galvanized iron pipe which had been in use for an indefinite period is here shown. The tuberculation is quite well developed, and the pitting of the surface between tubercles shows how completely the protection has failed.

The distribution of these tubercles suggests the action at some time of zinc-iron or some other couples. A strip of commercial zinc exposed to a trickling stream of water in a glass container, develops within 24 hours a series of spots of white products. If these be removed and the zinc be cleaned the formation recurs on further exposure to the water in the same spots distributed irregularly over the surface, but persistent each in repeated experiments. With galvanized iron the action is similar; the initial distribution of effected spots on the coating is persistent, and seems to indicate the location of a series of couples which accelerate the destructive action.

This trouble is not confined to St. Louis, nor to cities using softened waters. To a greater or less extent it probably prevails wherever coagulants are used. And in every case where the occurrence of zinc in a water conveyed through galvanized pipes is noted there should be taken up the consideration of the effect this slow uncovering of the iron body of the pipe will have upon the life of the installation. The purpose of this note is to call out statements of facts and discussion of a known situation. Eventually, perhaps, there may be found a substitute for zinc as a protective coating which will obviate the troubles arising from the high solution tension of zinc.

## PEAT AS A STEAM FUEL.*

W. G. Milne, Hamilton, Can.

We will consider peat for use as a steam fuel only in the following forms, so far as I know, they are the only ways in which it is obtainable for commercial uses at present:—(1) Cut Peat. (2) Machine Peat. (3) Briquetted Peat. (4) Dust Peat, or Peat Powder.

Raw Peat, as is well-known, contains at saturation about 90 per cent. of water, but this water content may be lowered by efficient drainage. With this content of water, it is manifestly impossible to burn it for any purpose whatever, and, we have found by the use of partly dried peat for part of one season, that the moisture must be reduced to about 35 per cent. before a fire can be made to burn at all briskly, or reach any high temperature. And it seems that in burning peat in any of the first three ways which require a grate of some kind, moisture up to 36 per cent. produces no bad effects unless it be that the maximum temperature attained is lowered, but there appears to be no loss in steam-raising power due to this moisture, although its effect would be apparent, no doubt, in a calorimeter test.

We used cut peat at our plant for part of one season, but its poor steam-raising power, together with the difficulty in handling and drying made it so unsatisfactory, that it was soon discarded as being too costly.

In the use of machine peat there is no doubt that it can be used very successfully as a steam fuel, provided it can be sold at a price which will compete with the anthracite coal. In many large plants they use so much fuel for producing heat for one purpose or another, that they are equipped with stokers and are thus able to do with few firemen and cheap coal, and machine peat would have to be made a most attractive proposition to offset these features, as it would require more firemen as well.

Briquetted Peat stands in the same class, in almost all particulars, as machine peat with regard to its uses in this respect. In the plant owned by Dr. McWilliam, we have often used the briquetted fuel under the boiler at times and found at no time any trouble nor indications that it would not keep up steam; and we considered that with it we could easily fire the boiler above its nominal capacity, if required.

With respect to Dust Peat, I have no doubt in saying that it is the best and cheapest way of generating power from peat, known at the present time, and I think that the advantages of its use for generating power by means of steam boilers and engines will only be eclipsed when a gas producer is invented which makes the gas direct from peat dust.

We have been obtaining our power by the use of dust peat during the last season, and may best explain its use by describing our application and apparatus. In our process, we find that the average moisture of the peat as picked up by the collector, is between 22 and 25 per cent. This is reduced to about 15 per cent. for briquetting, and, as the peat comes from the dryer, it is elevated to the top of our building and from there, passed out into heaters, through a chute, at an angle of about 45 degrees.

Opening from the bottom of this chute, and near its upper end, is a pipe leading down to a bin which holds about 1,000 pounds of peat. The peat in this bin has about 15 per cent. moisture. From this bin, the peat is fed, as required, by the amount of fire wanted, into a grain grinder, which so reduces it that all would go through a 16-mesh screen, but only 24 per cent. would go through 80-mesh. This grinding is, we realize, to waste, but we have not yet made the necessary changes to get finer dust.

As arranged at present, all dust from the grinder is blown through four-inch pipe into the boiler furnace where it burns like gas. At the present all we use to control the fire is a throttle valve on a small engine which drives both grinder and blower, thus, by slowing up, we get less fire.

We find that while carrying a load of about 55 horse-power, in addition to the engine operating the grinder, which takes steam to give us another 12 horse-power on the large engine, we burn about 300 pounds of dust at 15 per cent. moisture every 22 minutes; this gives us a consumption of about 280 pounds per hour, or, about 4.2 pounds of peat dust per horse-power hour, which, at a cost of Dust Peat to a consumer of $2.50 per ton would give him one horse-power 10 hours per day per year, of about $14. This figure of $2.50 per ton I may add is chosen because it is about one-half of the sale price of our briquetted peat, and does not indicate the cost of production of the dust.

*(Read at the meeting at the Jamestown Exposition).

## MILD STEEL EMBEDDED IN CONCRETE.

Sir John Brunner requested the National Physical Laboratory to report "On the Effect Produced on Samples of Mild Steel Embedded in Concrete." Dr. Glazebrook and his staff conducted the experiments and report as follows:—

"A strong wooden box was made and divided into five partitions, each partition being 12 in. long, 7½ in. wide, and 7½ in. deep. Specimens of mild steel of the following dimensions were prepared: 1. One inch diameter, 8 in. long, turned all over. 2. Eight inch lengths cut from a 1½ in. by 1½ in. bar with the scale left on. The partitions were half-filled with good Portland cement concrete, and a specimen of each kind laid on the top, and the partitions were then filled up. This was done on December 21st, 1906. The blocks were covered with water several times a week for a year, and for three months afterwards were left in the open subject to the weather. On April 20th one of the blocks was removed from the box and broken up, and the specimens removed. On examining the specimens carefully no trace of any action by the cement could be detected. The turned specimen was practically as bright as when it was put in, and the scale on the rough specimen was undisturbed. To test the possibility of any slight action the surface of the turned specimen was polished, etched and examined under the microscope side by side with a specimen of the same material cut from the centre of the bar. No difference in the micro-structure of the two specimens could be detected, and the conclusion is that in sixteen months no action has taken place between the metal and the concrete. It is proposed to immerse one of the remaining blocks in the comparatively warm water of the cooling pond for six months and then to examine the specimens—R. T. Glazebrook, Director, May 1st, 1908."