

after refining is used instead of crude petroleum, which would be much more dangerous. Italy, which is well-known to be enterprising in naval matters, has employed a mixed fuel of coal and petroleum on her man-of-war *Messaggiero*, whose speed was thereby increased from 15 knots to 17, but at some cost of injury to the boilers. Like trials at Spziza on the *Castelfidardo* and the *Ancona* have also been favorable. The oil thus used is petroleum refuse, which stands a fire test of about 300 Fahrenheit. Two competitive locomotives were run for five months on the Oroya railroad in Peru, pulling equal trains alternately over the same ground, and being exactly alike except that one used coal and the other oil for fuel. The consumption of oil per mile was 38.55 pounds; that of coal was 7.93 pounds. As a result, that railroad and one other are using oil for fuel. Indeed, along the South American coast some of the most striking instances of progress in this direction are found.

This consideration of the subject by Mr. Allerdice includes a citation of the views of Capt. Carmichael, the commander of the *Ewo*, already spoken of. He says that the petroleum residuum is perfectly non-inflammable until heated to 350 degrees, and consequently is safe to carry and use; that it has no smell, does not evaporate perceptibly, and does not deteriorate in metal tanks or injure them. The engineer can get the steam he wants without being dependent on firemen or on the weather, and the pressure on the boilers is steady and constant. There are no fire doors to open in coaling, and in the *Ewo* the tubes were only swept once in six months, and even then were not dirty. Large tank steamers could fuel a fleet, even in heavy weather, by the simple apparatus of hose and pump, whereas coaling at sea is a difficult process. Capt. Carmichael especially dwells on the safety of oil fuel, and its being "handled without risk of fire or explosion," while if stored on shore and bombarded by a fleet "shells could not set fire to the tanks." Of course combustibility is one of the great points to be considered, although it has sometimes been urged that, even admitting this liability, it could be obviated so far as danger from an enemy's shells is concerned by storing the oil under the water line. But bunker protection, now a great element in naval construction, would be sacrificed entirely by using oil for fuel. The cost of oil is admitted to be greater, but this is partly offset by a reduction in the number of firemen and in the expense, also, of their provisions and quarters. It is also evident that since there are no ashes to be disposed of and no tubes and grates to be cleaned the work of the stokers is much reduced. The total absence of smoke is as obvious an advantage as smokeless powder for armies, and it would aid alike in creeping upon a foe undetected and in escaping.—*American Engineer*.

SPONTANEOUS BLAZES.

In our last issue, mention was made of the burning of Siegel, Cooper & Co.'s mammoth store, in Chicago, when quite a million dollars' worth of property was destroyed. It was a great wonder and "the talk of the town" for two or three days, and then forgotten—except by some three thousand clerks, salespeople, teamsters, porters, janitors, and other wage-earners who temporarily are thrown out of employment by the destruction of their former place of work. "So great is the wealth, so numerous are the enterprises, so swift the motion of Chicago, that a disaster which would be date-making in the metropolis of an agricultural State is talked of for but a few hours, and then is forgotten as the manner of the death of Amenophis III.

"Twenty-five hundred people form quite a city in a farming country; most of the county seats in the forty-four States of the Union fall under this standard of population. Some of our great stores are filled, from morning till evening is far advanced, by a number exceeding the population of many a town that has its mayor, town council, and electric lights. This simple statement of fact throws the magnitude of Chicago's trade into strong relief, but it also emphasizes the necessity of protection against sudden fires."

The paper from which these quotations are made puts great stress on the necessity of making our great stores fire-proof—a very wise thing to do. But the reason for that necessity is much strained by the paper referred to. It says, "If such a fire had broken out, and consumed everything so rapidly as it did when the store was open, and with 2,000 or 3,000 customers and salespeople present (as was usually the case, especially on Mondays and Saturdays), hundreds of men and women would have been literally roasted to death, as they could never get away rapidly enough."

The fire broke out about 7 o'clock on Monday morning—just as some of the employees were beginning to arrive. No doubt it was the opening of the premises that started the fire—by letting in a flood of oxygen. If the cause of the conflagration was an overheated boiler, as is believed, the heat had penetrated the whole building, and its contents, more or less, and consumed the oxygen, for want of which the heat could not break out into a flame. But when the engineer (*Seafarth*) entered the building, smoke was immediately noticed over the boiler room; thereupon the foreman of one of the departments, "smashed a window in that quarter, and thereby unwittingly let in a flood of the very element which the intense heat was waiting for, so to speak, and then the whole building was ablaze as suddenly as a match is lighted. If they had kept out the fresh air, and diminished the great heat first, then that immense fire might have been avoided.

At all events that is how spontaneous combustion generally occurs, namely by letting in fresh air on intense heat. In fact, fire will not burn where oxidized air is excluded. And in the daytime, in a large store where thousands of people are present at one time, it is some consolation to think that a terrific blaze cannot sweep over the building all at once, as occurred on opening up Siegel, Cooper & Co.'s store on Monday morning. If a fire had broken out in the neighbourhood of the boiler room when the store was open, in the middle of the day, the flames would have consumed that portion first, and extended as the surrounding portions became heated, from the original blaze, which of course would be rapidly enough. But the point we wish to emphasize is, that to enable a blaze to spread like lightning, so to speak, the heat from the boiler must have been kept up for many hours, and absorbed the oxygen from the heated air throughout the building in a manner that could not possibly occur if the doors or windows had been open.

In this connection it may not be inopportune to remark that whenever an engineer finds, on reaching his place before a building is open, that the air is intensely heated, the slower he lets in fresh air (until the atmospheric heat is reduced) the safer will it be. And when a fire is discovered in a part of a big building (or in any building) it is the greatest folly to smash a window, and thus let in fresh air, as was done at Siegel, Cooper & Co.'s. Firemen often commit this great mistake. And we often read that, "when the windows were smashed, the flames broke forth like fiery tongues which licked up everything before them," or something to that effect. Every effort should rather be made to keep out the fresh air