boiler, and find out how much water you are evaporating per pound of coal, and keep at it until you have improved your work to such an extent that the difference in the coal bills will be a source of pleasure and profit to yourselves and your employer.

ZINC PROCESSES.

Three different processes, each believed to possess its peculiar advantages, says an exchange, are in vogue among the manufacturers of zinc in Europe. In Belgium, to get pure zinc from the oxide, the latter is mixed with coal and heated in a retort, the zinc volatilizing and coming out of the mouth of the retort as a vapor; cadmium is always mixed with the zinc, and cadmium vapor comes out first, and, when lighted, burns with a brown flame, the latter changing to green as soon as the zinc vapor begins to come off; an iron cap is then placed over the mouth of the retort, through which the vapor passes and is condensed into a fine dust, and gradually the cap becomes hot and melts the dust into liquid zinc, which runs into molds and is cast into blocks. The Silesian process differs from the foregoing only in the retort, the mixture of ore and coal being put in and heated, and the vapor passing out through a tube bent at right angles to the retort; the tube is kept cool, but not cool enough to condense the vapor into solid zinc, as, if this should happen, the pipe would become clogged and the retort would burst. In the English process the retort consists of a tightly covered crucible, through the bottom of which passes a pipe; the pipe is stopped with a wooden plug, and the mixture of ore and coal is put into the crucible and heated, and, as the mixture grows hotter, the plug is converted into charcoal, allowing only the zinc vapor to pass through it.

CRACKS IN BRASS PIPES.

Brass pipes may crack from several causes, such as over-pressure, bending strains due to lack of proper support, or to shocks caused by water-hammer. But in several cases breaks have been known to occur, says T. H. Bullock in the *American Machinist*, under quite moderate pressure, and where the pipes were entirely free from any external strain or water-hammer. He mentions an instance where a piece of 2-inch brass pipe about 4 feet long burst under a cold water pressure of 22 pounds. The pipe had three level supports in sixteen feet, and was supplied from a tank. The crack opened about a quarter of an inch wide and extended six feet. A piece 5 feet long cut from the other end, bore simultaneously a pressure of 200 pounds and a sharp blow from a hammer without fracture. That the part which cracked was under considerable internal metallic strain there can be no doubt, for a piece 12 inches in length required a weight of 1,781 pounds to bring the edges of the crack together again. Probably what has a good deal to do with the question of why do brass pipes crack, is the hardness of the metal, though why in the case under consideration there should be such different degrees of it within such a short space, is puzzling. Mr. Bullock, to satisfy his curiosity, made some experiments in the matter, in which he compared the various tones given out by different pieces of brass tubing when struck with the notes of a piano. These experiments seem to indicate that the inner portion of the metal of the pipe that burst was under a severe compression strain at the point where the break occurred, but that the other end of the same pipe was substantially free from such strain. It also seemed that in some specimens the outside portion was under strain, as the pipe closed slightly when planed open. It also seems that hardness can be ascertained by tone, and we may yet use standard tuning forks for examining pipe before its acceptance, for the tones given by the several pipes when knocked seemed exactly like those given out by the piano.

A speed regulator for steam engine governors has been patented, the object of which is to balance the centrifugal force at the different planes in which the fly-balls revolve. The idea was explained at the recent convention of stationary engineers at Montreal. This invention is mentioned in the list of patents given in last number.

THE attention of the Customs Department having been called to want of uniformity in the assessing of duty upon brass pumps imported, collectors of customs are instructed that such pumps, whether hand pumps or stationary, are dutiable at the rate of 35 per cent. under the terms of Item No. 407 of the tariff. A recent circular conflicting with this is repealed.

THE air thermometer is the name given to a recent English device for giving warning of a fire. In this apparatus the expansion of air by heat in an air box fitted to the ceiling of the room is made to inflate a thin, hollow India rubber diaphragm. This raises a small terminal rod, bringing it into contact with another terminal, an electric circuit being thus completed, the current ringing an alarm bell and releasing a semaphore, which serves to indicate the location of the outbreak.

AN electric pump has been invented in behalf of which the following claims are made: As the motion is purely rotary, there is no need for a special foundation, and that owing to the absence of valves, grit and thick water will pass through without trouble. It is a rotary screw pump, having four screws mounted in pairs on parallel shafts. The pump and motor have one of these shafts and the other is driven by means of gears. The suction is at the bottom, the water going to both ends of the pump; the discharge is in the middle on the top, and the back pressure due to the head is thus divided equally between the two pairs of screws, and as they are in opposite directions on the same shafts, the thrust is perfectly balanced. One advantage of this form of pump is that the flow from it is quite regular, thus doing away with the pulsations of the reciprocating pump The pump being rotary, and running at the same time as the water, there is no need for any intermediate gearing, and there is consequently a great saving in wear and tear

WHEN putting up a steam pipe between boiler and engine, it should be made to slope slightly toward the engine, so that all the water and condensed steam will be carried forward, as it cannot be made to run back against the flow of the steam; for water once in the pipe must move forward, and if no outlet is provided it must travel through the cylinder of the engine. The water can be kept from the engine by putting a separator or water catcher in the horizontal pipe near the last end before it reaches the engine. A small pipe will lead from the back to the boiler, trapping the water before it reaches the cylinder. By the use of this simple arrangement, the steam supplied to the cylinder will be much dryer and give better results in doing the work; it will also remove the danger of injury to the engine on account of entrained water. The pipe leading back to the boiler need not be larger than ¼ or 1 inch in diameter for engines of 100 horse power or less. If a water glass forms a portion to the return pipe, it will show that a surprising amount of water is returned from the steam pipe to the boiler. This water would otherwise have gone through the cylinder, requiring a greater amount of lubrication, assisting or causing leaks and presenting a possibility of great danger to the engine. In boiler tests, the steam which is condensed in the pipe and the water carried off by priming, is often credited to the coal, when a large portion of it is due to priming effects. The condensation of steam in the steam pipe is much greater than is generally supposed, and is always so much that greater economy in fuel would be obtained if the pipes were covered with some good non-conducting substance, such, for instance, as those advertised in THE CANADIAN ENGINEER. The different forms of separators employed in steam pipes serve an excellent purpose in providing dry steam only to the engine, but if steam pipes were well covered the work required of the separator would be reduced, in many cases, much more than one-half.