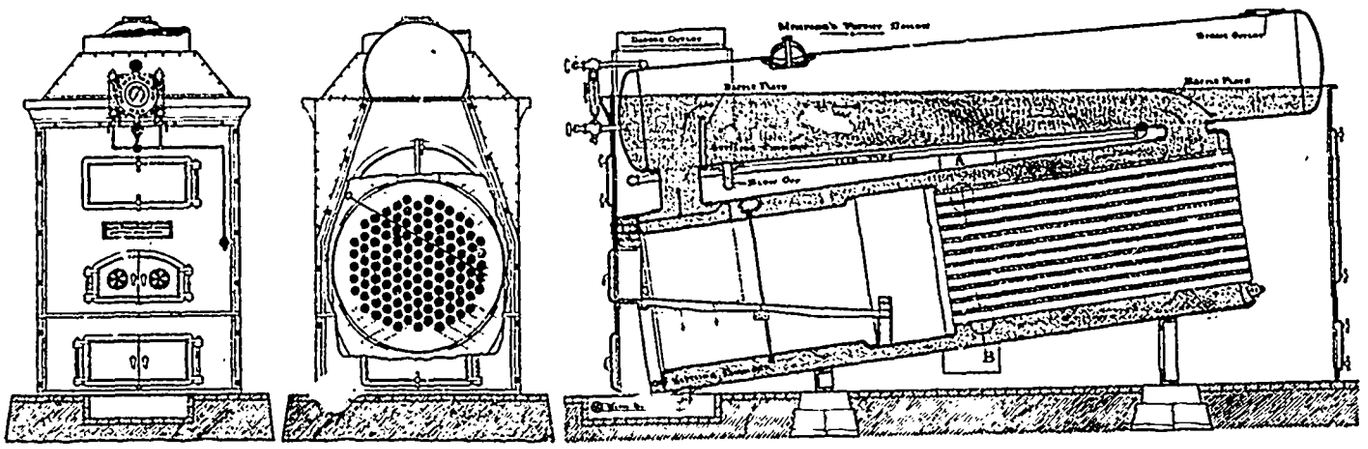
MUMFORD'S IMPROVED BOILER.

On this page we illustrate a new boiler intended to meet the demand for greater economy and efficiency than are obtained from the ordinary brickset boiler. The water circulation is similar to that of a water tube boiler, and for very high pressure it is built with a corrugated furnace. It was designed by J. A. Mumford, and is manufactured in Canada by the Robb Engineering Co., of Amherst, N.S., and in the United States by a large concern in Erie, Pa. The furnace has ample room for mixing the gases, and is surrounded by water so that the direct and radiant heat of the fire is readily absorbed. The heated gases pass directly through well-proportioned tubes, and return around the shell of the boiler and underneath the drum; thus, it is claimed, making every square foot of the boiler effective as heating surface, and enter the smoke stack with sufficient temperature remaining to produce good natural draft. By covering the case and drum with a non-conducting material the loss of heat is reduced to a minimum. The water circulates continuously from the front to the back of the boiler, up the back connection to the drum, where the steam freely separates from the water, and down the front connection to a point below the fire This positive circulation admits of using forced draught, increasing the horse-power of the boiler without foaming or priming, the increased temperature increasing the speed of the water circulation, the makers claim, without any evil effects.



Special arrangements are made to avoid trouble with bad water. The feed pipe enters the drum near the back end, and part of the sediment is deposited in a settling chamber at the front end of drum and may be blown out. Additional impurities that are carried down the front connection are deposited in another settling chamber below the furnace. This leaves very little, if any, impurity to form scale on the furnace and tubes, and it may be removed by a scraper inserted through hand holes in the shell, the tubes being spaced so that all can be cleaned. Doors are placed in the casing opposite these hand holes which also give facilities for cleaning the outside of the shell. The Robb Engineering Co inform us that they have already installed two of these boilers in Montreal, and others in Lethbridge, N.W.T., Fort William, Ont. and Parrsboro, N.S., while a number more are ordered.

THE NAVIGATION OF THE AIR.

Editor CANADIAN ENGINEER:

In your issue for November I notice an article on "The Navigation of the Air," by C. Baillairge, C.E., and thinking some of your less scientific readers might be left in the dark through the nature of his article, I am led to make a few remarks, in the hope that they may somewhat clear the obsurity as to the principle, method and nature of the most successful attempt at aerial navigation in the last few years.

In the article Mr. Baillairge says, "that there never has been an attempt (at imitation), as with flying machines, to imitate in the balloon the shape of a bird on the wing;" and then again he says, "there must be (imitation), to be successful in directing them" (balloons). Now here we have a man trying to advocate an old and exploded theory, that of navigating the air with a machine that is itself many times lighter than the element in which it floats. Not on, remember, as in the case of the ship, which case he tries to parallel with that of the balloon, and says, "as man has become (successful) in propelling vessels through the water, by building them in imitation of the fish." Here we see what similarity exists between a fish and a modern steamship, such as the "Lucania," as ships, I believe, move partly through and partly over the water, whereas the fish moves entirely beneath and through that element. Now as to the propelling power, with reference to that of the fish, again we fail to see the similarity between the two. The fish propels itself by its tail, using its fins as auxiliary motors; but in the steamship, where is the mechanism representing the tail or the fins of the fish? It is true you will find the respective motors in the same relative position, but the resemblance between them I think is very slight. One being an oscillating movement of a fan-shaped appendix, the other a rotary motion of a blade screw. So that we see that the supposed likeness, referred to by Mr. Baillairge, does not really exist.

Then he continues: "Nor will flying-machines ever prove a success until some closer imitation has been arrived at, than heretofore, of the winged denizens of the air." Now, to take some other problems that have been solved by our inventors and mechanical engineers, not in the way suggested, by adhering strictly to Nature's models, but by radical departure in some instances. Firstly, had we imitated the ox or the horse and made the machine which draws our trains to-day, walk on legs, instead of roll on wheels, we undoubtedly would not have had trains whisking us through space at 60 and 112½ miles per hour. Secondly, had our marine architects imitated the fish and his oscillating tail we would not have had a "Campania" or "Lucania" crossing the Atlantic in less than six days, or a torpedo boat rushing through the water at 37¾ miles an hour.

Then is not a flying machine proper, the "aerodrome," a nearer imitation to nature's model than the "soaring machine," advocated by Mr. Baillairge, which is merely what is known as a "steerable balloon," slightly modified? I think so, inasmuch as it is vastly heavier than the air, which fact is true of nature's various models. Then again, he continues, with reference to the relative buoyancy of the balloon against that of the air-ship, "thus, as it is, the balloon is buoyant, but without the proper shape to render it possible to direct its motion, while the 'sky-flyer'—this we interpret to mean air ship, though we never have heard the term used before—is deficient in the opposite sense of having the power of direction without the buoyancy." We doubt if the latter part of the above statement will stand investigation, for surely had the author made the slightest pretence at ærodynamics or æronautics he would have known that the flat or concave surface of any considerable extent (not being prohibitively heavy) when held rigidly at an angle of from 3° to 8°, and moved rapidly forward in a horizontal line, does not need any buoyance outside of itself to retain it in space, its own onward movement being sufficient. That this is the true principle of air navigation has been proved by Langly, Maxim and others. And we may say here without going further, that our inability to steer balloons is not on account of their shape but on account of their weight, or more correctly speaking, the absence of the above property. Had a balloon got the weight, still retaining its floating qualities, there would be little difficulty found in directing its motion.

A little further on Mr. B. tells us to "try to conciliate or combine the two requirements or desiderata."—that of the balloon and air-ship—the two he says must be blended. Believing him to be an advocate of the rule, that "nature must know best," and that in experiments nature's models should be followed as closely as possible, his argument here seems not a little inconsistent. Here we would ask him, if instituting a compartment filled with gas in his flying machine or bird-like structure is imitating nature's model? and if so, in what part of the bird's anatomy the balloon-like structure is located? Further on continues the author, "there is another cause which helps the bird to soar on air" (the first cause mentioned was the bird spreading its wings and extending its tail so as to underlap them, thus forming a kind of æroplane) "this is the very heat generated by the bird's body." Then he asserts that the heat generated by the bird rarifies the air contained in the cavity between the wings. Now, to the generality of us this statement is rather confusing, for heretofore, we were not aware that any cavity existed between the wings, though there may be something of that nature beneath them, it is generally believed that between the wings is located the birds body. As for the air being rarified by the heat of the bird's body and imparted to the cavity or concaved surface of the underside of the wing, thus having