



### STEAD'S CIRCULATING GENERATOR FOR STEAM BOILERS.

#### IMPROVED CIRCULATING GENERATOR FOR STEAM BOILERS.

The principal advantages claimed for the invention herewith illustrated are a large saving of fuel, the rapid generation of steam, and increased durability of the boiler. The engraving shows the brick wall on one side of the setting broken away so as to give a clear view of the circulating apparatus and other parts underneath, and attached to an ordinary horizontal boiler. D is a riveted steel drum placed on a brick bridge wall, which is lowered so as to allow the top of the drum to be of proper height in relation to the grate and opening for the products of combustion. Through pipe, N, the water passes from the bottom of the boiler into this drum, where it is converted into steam and superheated water to a temperature higher than that in the boiler, to which it returns with great velocity through pipe H. A constant circulation is maintained and the formation of scale over the furnace thus prevented. Besides the gain in evaporation, which is a very important feature, there is also another advantage in having lime and other impurities in the water pass into the drum.

The peculiar arrangement of pipes, G and H, is such that impurities cannot return to the boiler, but can be blown out through pipe F, or if necessary, a together removed by means of the hand hole, E, which is placed at end or back of drum as may be necessary. In the rear of the drum, and extending to the back connection wall, is placed a coil of heavy lapwelded pipes, A A, which rests on bearers let into side walls; this coil is connected with the boiler at back end by pipe, P, and at the top by pipe, J; it is also connected with the feed pump by pipes, M O, and their branches. A deflecting wall resting on a heavy iron bearer is also built under and close to the boiler at the back end, as shown in the engraving. The combustion of gases ignited in the furnace is maintained the entire length of the boiler in the coil chamber. When the flame strikes the deflecting wall it passes through the openings between the coil pipes and returns backwards through the tubes in the boiler. The feed water for the boiler enters this coil from the heater in use or in a cold state by pipe M, and in its passage to the boiler, which is very rapid, it becomes heated to a temperature ranging from 250° to 300°.

To preserve the coil from any liability to burn, as well as to secure circulation from the back of boiler, a connection is made by pipe, P, with a pipe leading to coil, and an ingeniously constructed swing check valve, invented by the patentee of this circulating generator, is attached to this pipe. This valve is partially open when the feed pump is operating, and the water from

the boiler unites with the feed water, raising the temperature of the latter to nearly boiling point before it enters the coil. When the feed water is stopped the check valve opens wide, giving unobstructed passage of the water from boiler to coil, through which, by its increasing temperature, a rapid circulation to the boiler is maintained. By opening valve K, the coil can be cleaned. (We are informed, however, that there is no liability to clog even where this precaution is neglected, so rapid and continuous is the circulation.)

The manufacturers state that the device causes a greatly increased power of boiler, "a gain of over fifty per cent being shown in some cases, due to the perfect consumption of fuel and utilization of heat, by which an evaporation of twelve pounds of water to one pound of coal is frequently attained." The circulation is claimed to be continuous, giving equalized temperature, even expansion, and contraction and freedom from scale deposit; also rapid loosening of scale if formed in a boiler previous to the generator being attached. It is further claimed that there is additional security against explosion, inasmuch as the feed water can never enter the boiler when fired, except at a temperature almost equal to that of the water already in the boiler.

**RESULTS OF THE CHALLENGER EXPEDITION.**—The following observations are reported by Professor Agassiz: Where the depth is 1,800 to 2,000 fathoms inside the Windward Islands, the fauna corresponds to that of the Atlantic outside; the animals having doubtless penetrated through the openings between the islands. All classes of the animal kingdom found in the ocean are well represented. Inside the Caribbean Sea the fauna is more specialized and characteristic. On the Challenger expedition it had been ascertained that the red clay ooze of the ocean bottom was largely a result of the decomposition of the shells of surface animals—a disintegrated portion of the limestone contained in those shells. Everywhere in the Gulf a similar deposit was found. Pelagic animals, chiefly mollusks, may be said to fill this sea from the surface to 8.10, or 25 fathoms in depth. The dredge always brings up a quantity of these half decomposed shells, and in instances where the test of proportion was carefully tried, it was found that more than half the mud consisted of shell fragments. There is no doubt that a stratum is forming at the bottom of the sea, due entirely to the coverings and hard parts of pelagic animals, which exist in swarm near the surface. On the question as to the existence of many animals in deep water, near neither the surface nor the bottom, Professor Agassiz is inclined