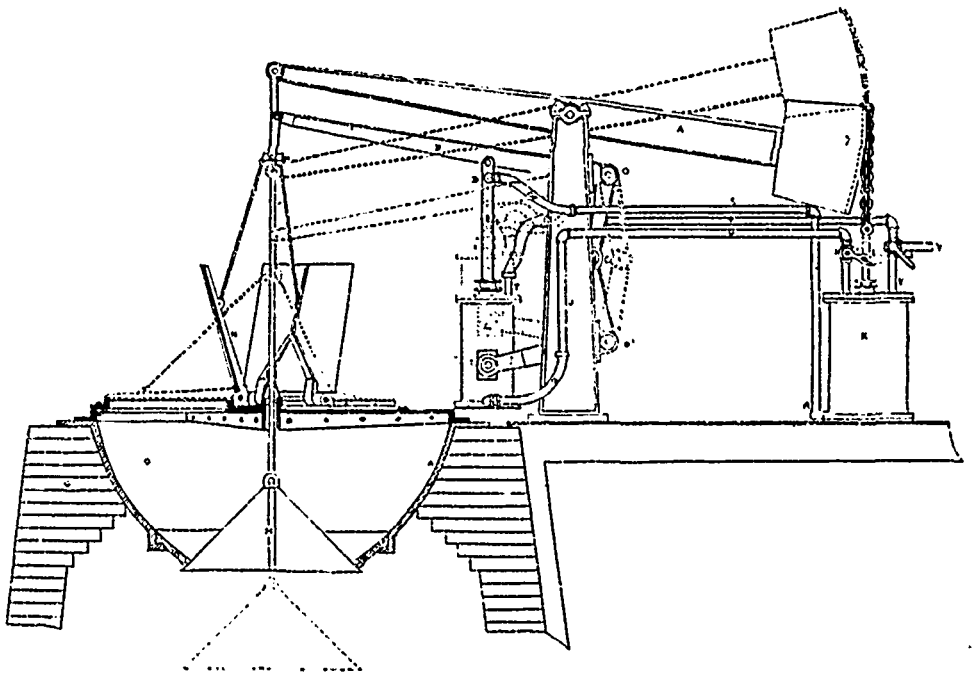

THE AUTOMATIC GAS SEAL.

four by thirty-six inches. If steam be employed, which on the whole is preferable, the diameters may be reduced from eighteen to six inches and from thirty-four to eight inches, respectively.

The operation of the automatic gas seal is as follows. Supposing the hopper to be charged, the valve J is turned so as to admit the blast through T G I into the cylinder, where its action is upward on the cylinder head and downward on the piston, causing B O to descend and the seal to be closed. At this instant the port hole in the hollow piston rod will have entered the cylinder, thus establishing communication through D C S E with cylinder K. The blast in entering raises the piston, this allowing the bell H to lower and the contents of the hopper to be discharged into the furnace. The apparatus has now taken the position shown by the dotted lines. The bottom of the hopper is open, but the top is completely closed, thus preventing any gas from escaping. Reversing the valve J the air enters through Y into K, causing the piston to descend and the bell to be brought to its seat. At this moment the pin I will have opened the valve H, allowing the air to pass through H U L G to the cylinder, where its action and reaction causes the lids to be raised, leaving the hopper open to receive another charge.

The automatic gas seal requires no extra labor to manipulate it, it can neither be neglected nor misplaced, consequently the furnace is never open to the atmosphere and no gas is permitted to escape.

The advantages of a gas seal on a blast furnace are manifold, and its economical value much more far reaching than would appear at first sight. First and most apparent is the saving of the gas which ordinarily escapes while lowering the bell. The amount of gas thus actually lost varies with the relative number of charges and the time required in discharging, but will in no case figure less than equivalent to one ton of coal per 100 tons of iron.

There is also an indirect loss of fuel. First, in the furnace itself, due to the dilation of the gaseous contents and the loss of sensible heat carried off by the volumes of escaping gases. Second, when, while lowering the bell, the gas escapes at the top of the furnace, there is an inrush of cold air into the combustion chambers of the hot blast stoves and under the boilers. This has a cooling effect which undoubtedly causes as great a loss of fuel as the escaping gas itself, which would increase the fuel economy due to the gas seal to two tons per 100 tons of iron made. The items of fuel which are saved by a gas seal, although small per ton of iron, will amount to several times the cost of a seal in a single blast. It is, furthermore, not to be over-looked that a device which completely shuts off the gas and, requires no extra labor must be a boon to the "top filler," who is ordinarily more or less exposed to the noxious gases.

All these advantages, however, are of small significance compared with the great office of the gas seal to reduce repairs. First, the furnace itself, since the bell and lipring are scarcely ever worn out, but always burned or warped by overheating caused by the ignition of the escaping gas, it follows that when the hopper is provided with a seal which renders ignition impossible they may last an indefinite length of time. Furnace managers know that the most careful attendant can not always prevent the gas from lighting, and that it is only in rare and exceptional cases that a bell and lipring last through a whole blast; but, on the contrary, not unfrequently have to be replaced several times, the expense of each renewal by far exceeding the cost of a seal. Second, repairs in the hot blast stoves. The iron pipes may become warped by overheating, and can even be melted down by too strong a fire, but are invariably oxidized (burned) by the currents of uncombined oxygen impinging upon their hot surfaces while the gas ceases to flow.

The frequent failures of the iron pipes, the attendant delays and consequent heavy expense have induced not a few of the most experienced furnace managers to condemn the iron stoves and erect fire brick stoves at great cost, where a few hundred dollars invested in gas seals might have helped them over the difficulty.

Last, but not least, are the boiler repairs. The frequent explosions, numerous narrow escapes, and countless minor "give outs" in furnace boilers have in nine cases out of ten been traced to the continued strain caused by the expansion and contraction due to the intermittent flow of gas. This item is of the most vital importance, since it is not only a source of much annoyance and expense, but may result in fatal accidents. The deleterious effects of the change of temperature, and of the shocks caused by the sudden ignition of the re-entering gases on the walls of the hot blast and boilers walls, is also an item worthy of consideration.

Thus, considering the advantages of the gas seal in all its bearings, it is evident that it is destined to become a factor of no small import in the economy of iron smelting.

Mr. Ed. A. Uchling, of Sharpsville, Pa., is the patentee.—*American Inventor.*