THE AUTOMATIC GAS SAVER.

It has been calculated that the average consumer of illuminating gas, in large cities, is subject to a waste which costs him from one quarter to one third more for gas than is really necessary to produce the requisite light. The reason is obvious from the fact that the pressure, as transmitted from the works, must always be sufficient to insure a full supply, not merely to the highest places, whither the gas rushes at greatest velocity, but to the lowest localities. The normal pressure, therefore, never falls to a point at which no waste at the burner can take place. Nor is it, indeed, possible for the manufacturer to supply each customer with the proper pressure to insure the greatest luminosity, for he is prevented, both by difference of situation of points of delivery and by the constant variation in the quantities drawn from the works by individual consumers. Cutting off at the service cock or using check burners simply reduces the light without affecting the proportional degree of waste; so that the only valid means of avoiding the latter lies in an apparatus which will automatically control the pressure, keeping the same uniformly at the most advantageous point, as the gas leaves the meter.

Fig. 1.

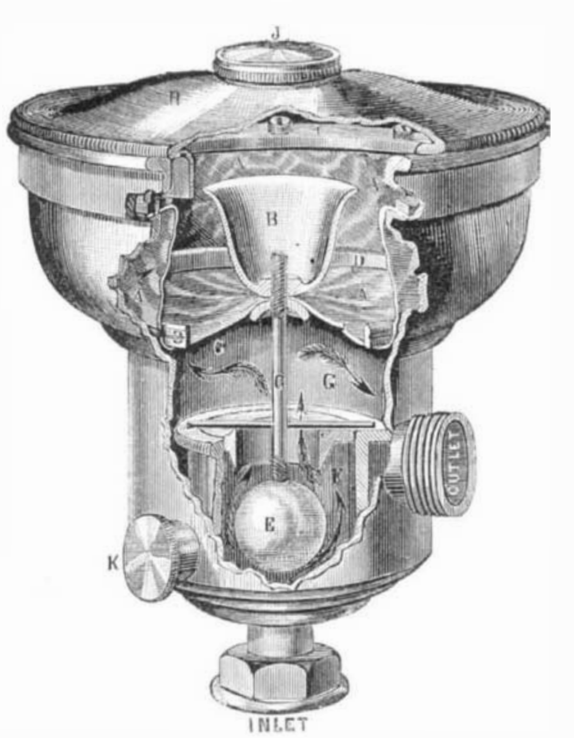
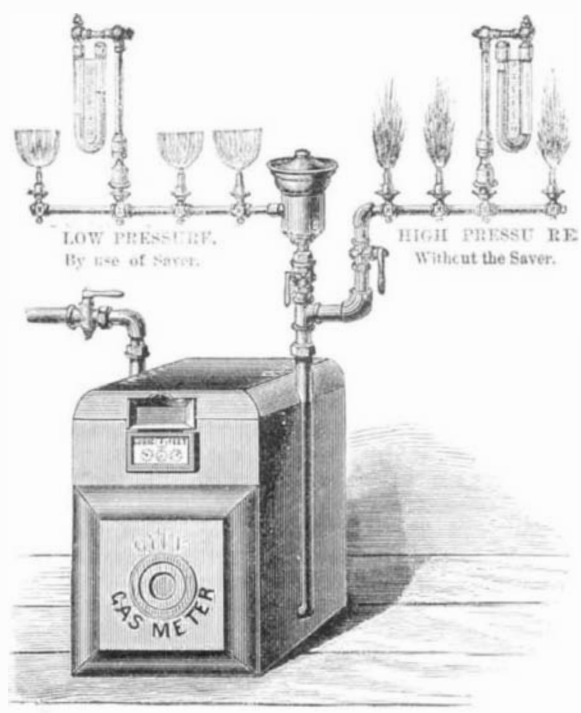


Fig. 2.



THE AUTOMATIC GAS SAVER.

A new machine for this purpose has lately been patented (May 19, 1874), and engravings of the same are presented herewith. The noticeable feature is the absence of the straight diaphragm, heretofore commonly employed, forming a flat dish, with the valve rod secured to its center, and governing the valve through its being forced upward as the pressure is augmented. The difficulty, due to the hardening of this appliance and consequent loss of its vibratory power, is, it is claimed, obviated in the present apparatus, by making the device of leather, covered with graphite, and in telescopic form, so as to have from one and a half to six inches vibratory motion, according to the size of the machine.

The operation will be understood from the sectional view, Fig. 1.

An increase of pressure, whether it occurs in the mains or service pipe, by putting out lights, is instantly communicated to membrane, A, the tension of which is thereby increased. As the membrane expands it is forced upwards, carrying with it the rod, C, which works the valve, E, and contracts the aperture through which the gas enters chamber, G; the quantity now admitted in a given time being exactly equal to that which passed when the pressure was less and the opening greater. When the pressure again diminishes, the tension of the membrane is of course relaxed, and being forced downwards by the weight in the cup, B, again carries with it the rod, C, and the aperture to the chamber, G, is enlarged. Thus it will be seen that the saver is a self-acting valve, the operation of which depends on the equalization of antagonistic forces, namely, the pressure of the gas within the chamber, G, impelling the membrane outwards, and the weight without impelling it inwards. By the combined action of these very dissimilar agents, the area of this aperture, by which the gas enters chamber, G, is exactly adjusted to the velocity with which it moves. From the chamber, G, the gas escapes by the outlet pipe.

The comparative size of the apparatus and its mode of adjustment to the meter are shown in Fig. 2. The effect upon the flame will also be noticed. The construction is substantial and durable, the best quality of sheet copper, without seam, being used to confine the gas. The valves are ground and fitted so as to control a single burner, and may be readily cleaned of impurities.

The manufacturers add that whoever pays six or eight dollars, or even less, a quarter for gas, will save at the rate of from twenty to forty per cent on his gas bills by using this machine.

Further particulars regarding sales, and also relative to inducements to agents, may be obtained by addressing G. S. Lacey & Co., 615 Broadway, New York city.

Action of Sulphuric Acid on Iron and Steel.

Iron or steel wire which has been acted on superficially by sulphuric acid is usually found to be altered in its properties. Its weight is increased, its tenacity is injured, so that, originally soft and flexible, it easily breaks; and when a freshly broken end is moistened by the tongue, it effervesces as if acted on by a mineral acid. These effects after a time disappear. Professor Osborne Reynolds, of Manchester, has ascertained that they are owing to the absorption of hydrogen generated during the chemical reaction which takes place when the wire is immersed in the acid. He found that if an iron tube, closed at one end, be immersed in a dilute solution of sulphuric acid, hydrogen passes through the walls of the tube into the interior, and may be collected by attaching an india rubber tube to the open end of the iron one, and passing it under a gas holder. Professor Reynolds concludes that, whenever iron undergoes oxidation under water, it becomes saturated with hydrogen, and thus loses tenacity—an important consideration in the case of iron steam boilers on iron ships.

CHAIN TOWAGE ON THE ST. LAWRENCE.

By some oversight of our forefathers (not, however, made by the aboriginal Iroquois, whose town of Hochelaga was at the foot of the current), the city of Montreal was built at the head of the rapids; and as, year by year, the trade of the city has increased, the number of vessels and their size has kept pace, until the difficulty of getting ships into the harbor became most formidable, involving great expense in towage, and, in the case of large sailing vessels and light-powered steamers, no inconsiderable delay from the impossibility, with unfavorable winds, of getting tugs enough about a large ship to drag her up the pitch.

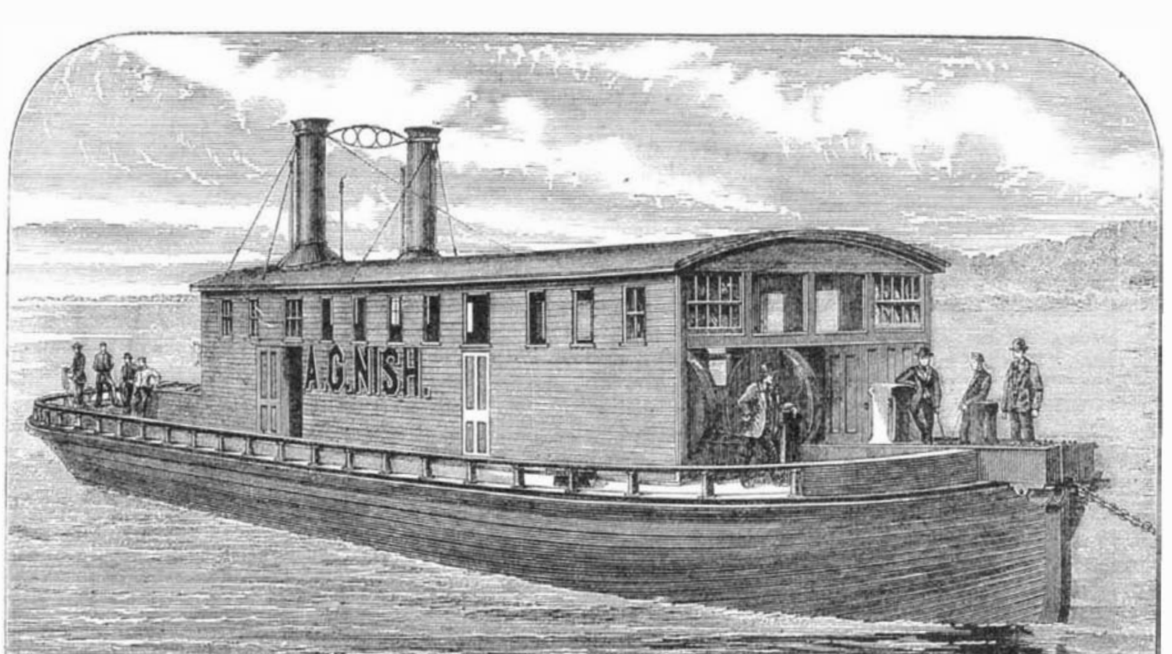
Various schemes were suggested for avoiding the difficulty: a ship canal coming in behind the city, piers at different points with stationary winding engines, etc.; but eventually Mr. A. Gilbert Nish, the engineer of the Harbor Commissioners, determined, under instructions from the board, to make a trial of the submerged continuous chain system, as used on the Seine below Paris. The circumstances of the two cases were, however, so entirely different that a scheme, which might succeed with the comparatively small barge, and sluggish current of the Seine, would be a total failure with ships and steamers from 1,500 to 3 500 tuns burthen drawing from 20 to 22 feet of water, contending against a volume and velocity of water that, in the event of "taking a shear," will "whip" a 1,500 tun ship to and fro across the current with almost the speed and as little apparent effort as when a current of air plays with a boy's kite.

In designing the new machinery, Mr. Nish, assisted by Captain Wright, the mechanical engineer to the trust, decided that every part should be constructed as strong, and of as few pieces, and as little liable to derangement, as possible. With this end in view, Captain Wright abandoned entirely the wheel gearing used in the wire rope and chain systems of Europe, either as a means of obtaining purchase or connecting the chain drums. The power was obtained by a pair of long stroke engines, and the connection of the chain barrels by coupling rods, set at right angles, similar to those used in locomotives.

With these instructions, Mr. E. E. Gilbert, of the Canada Engine Works, Montreal, was intrusted with the work of completing the designs and working out the details. The engines are non-condensing, with cylinders 22 inches by 5 feet stroke. The frames are of the Corliss type, extended to receive the bearing of the outer chain barrel shaft. The weakening effect of lowering the first barrel shaft to the center line of the cylinder is counteracted by using a sufficiently heavy pillow block cap, well fitted in the gibs, to maintain the full section of the frame; the brasses are closed by side keys in the usual manner. The chain barrels are 2 feet in diameter, carrying nine tuns of best 1¼ inch short link crane chain, the total length of the chain being 7,000 feet. The two sides are bolted together by heavily flanged crosstie boxes, forming a very rigid structure, which, so far, has proved unyielding under the severest strains. The platform is of cast iron plates, reached by steps from the rear of the cylinders. The whole arrangement has a strong, compact appearance, and works quietly and without vibration under full steam and the severest strains.

The cable was laid early in July, 1873, and the tug brought a large steamer up the rapids on her return trip from laying the chain. She was worked daily until the closing of navigation in November, 1873, without the slightest breakage, delay, or mishap of any kind, and proved in every respect a perfect success, and, in the single instance of hauling the steamer Precursor (which would otherwise have been abandoned) off the rocks, saved her own cost five times over. In hauling off the Precursor, as the usual boiler pressure of 60 or 70 pounds did not appear sufficient to move her, the pressure was gradually increased until, at a little over 90 pounds, the stranded steamer began to slide into the deeper water. As the engines kept barely creeping round, stretching the hawsers as the pressure increased, it is probable that the pressure in the cylinders was nearly that of the boilers.

The speed of the tug against the current is from four and a half to five miles per hour, and the speed of the engines from 55 to 60 revolutions per minute. The expense of fuel, etc., is very small. The principal expense of hands is caused by the number of men required to haul aboard, in a strong current, 100 fathoms of tow line. This, however, it was, when we last heard of the vessel, intended to remedy by the substitution of a donkey engine for manual labor. The total cost of this vessel, of which we here give a perspective view, has been $25,000, including the 7,000 feet of chain.—*Engineering.*



CHAIN TOWAGE ON THE RIVER ST. LAWRENCE.

THE iron establishments of the United States, including furnaces, rolling mills, steel works, forges, and bloomeries, are as follows: 681 completed blast furnaces, 343 rolling mills, 51 steel works, 37 forges, and 47 bloomeries.