BLAST-FURNACE CHARGING APPARATUS.

THE advantages derived from working blast-furnaces with closed tops are being largely recognized, and we give illustrations showing an arrangement of charging apparatus, manufactured by Messrs. Weimer & Birkenbine, blast-furnace engineers, of Lebanon, Pa.

According to this plan, the tunnel head of the furnace is fitted with the usual form of bell, hopper, and lip-ring, the lower part of the bell and the bottom of the lip-ring being turned off so as to make a tight joint. On the top of the hopper is placed an iron cover, provided with three or more openings (the engravings show three openings), which can be closed at will by sliding doors. The rod supporting the bell passes through the top of the cover, and is attached to one end of a beam, which is supported upon a casting of sufficient strength, combining two cylinders, one horizontal and the other vertical, with their necessary ports, etc. The piston in the horizontal cylinder is connected by means of piston and connecting-rods with a revolving plate on top of the cover, to which the doors are attached. These doors are hung on hinges, so that in case of any excessive pressure they will open, or it may at some time be desired to lift one or the other of them. The piston in the vertical cylinder is connected by a piston-rod with the end of the beam opposite that to which the bell is attached.

FIG. 1.

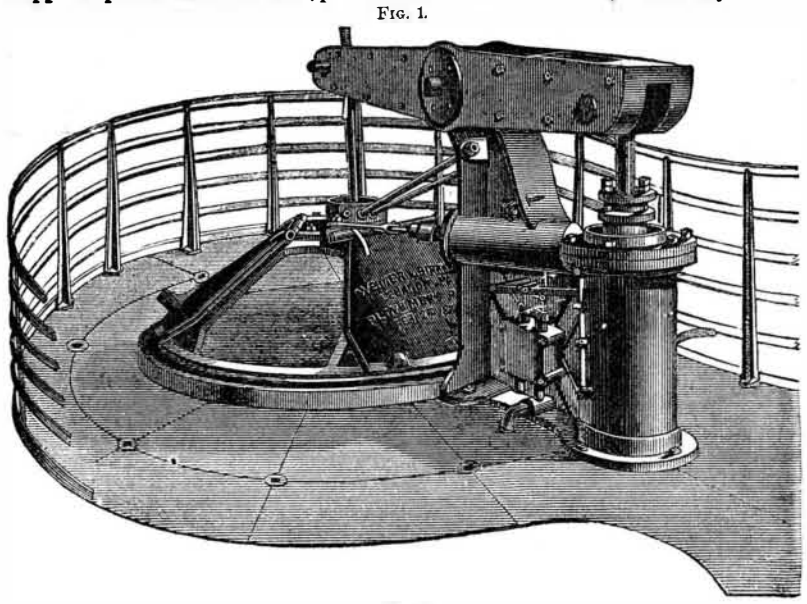
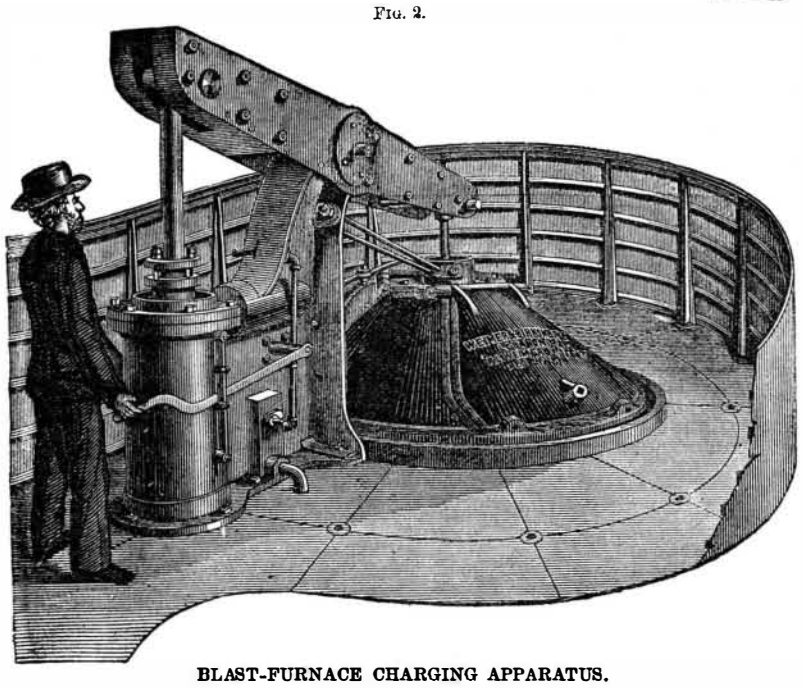


FIG. 2.



BLAST-FURNACE CHARGING APPARATUS.

The engravings show the bell closed and the hopper ready for its charge, which is supplied by means of the usual charging barrows dumped through the open doors. When the charge is to be dropped, the attendant depresses the left-hand lever, shown in Fig. 1, which, admitting steam into the horizontal cylinder, causes the plate on top of the cover to revolve and carry the doors with it, thus closing the openings. A small safety-valve placed on the cylinder prevents risk of damage by too sudden closing. When the doors are closed, the right-hand lever, Fig. 1, is raised, which, by admitting steam into the vertical cylinder, drops the bell and its charge. By depressing the same lever, the bell is raised again to its position, and the valve arrangement is such that the movement is under the easy control of the operator, who can bring the bell to its place as gently as he pleases. The screw on the rod supporting the bell admits of its exact regulation, and the swivels admit of perfectly free motion; the top of the cover acting as a guide.

When the bell is in place, the left-hand lever, Fig. 1, is raised, which causes the doors to open. Fig. 2 is a view of the apparatus with the bell dropped and the doors closed; it also shows the opposite side of the supporting casting. The apparatus can be operated by steam, air, or water-power, and can readily be removed in case any repairs are necessary at the tunnel-head. Special provisions are made to obviate difficulty when a bell falls into the furnace or accidents occur. The only gas which escapes is, obviously, so much as can be contained within the space between the bell and the cover—a very small amount. Mr. Weimer states that with the usual mode of dropping the bell, a fair approximation of the daily waste of gases from a moderate-sized furnace would be from 60,000 to 100,000 cubic feet, a quantity which is surely worth utilizing. This apparatus also obviates the necessary changes in temperature and pressure, which must follow the opening of the full area of the tunnel-head every few minutes.

IMPROVEMENT IN THE MANUFACTURE OF GAS.

By G. OLNEY, Brooklyn, N. Y.

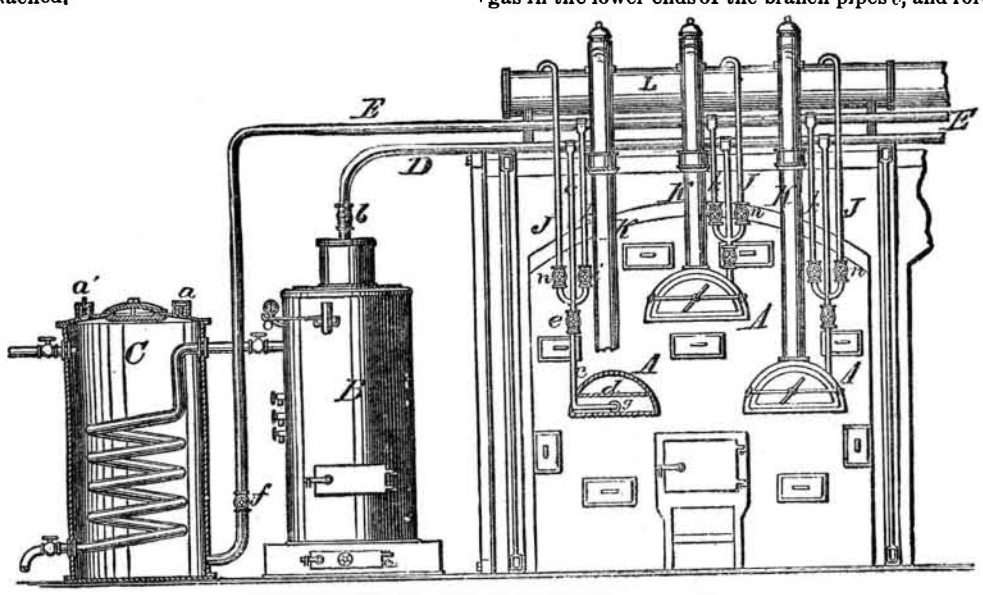
I HAVE found that, when a hydrocarbon mixed with steam is injected into a highly-heated retort, the hydrogen set free from the steam does not readily combine with the coal-gas; but if common coal-gas, mixed previously with steam and a gas from a hydrocarbon, is injected into the retort, a chemical union of the gases will quickly take place, and a perfectly-fixed gas will result. This is evinced by the fact that a steady light is obtained, that no stratification of the gases in the pipes is found, and that the coal-gas produces a much larger volume when it is treated with the hydrocarbon fluid and steam.

A, bank of retorts; B, steam-generator; C, reservoir for petroleum. Two valves, *a a'*, are applied to the top of the reservoir C. One prevents a vacuum being created therein, and the other allows the escape of air while filling the reservoir. D, steam-pipe, with regulating-cock, *b*, and from which branch pipes *c* are carried down into the front end of each one of the retorts A, terminating beneath the diaphragm *d* therein in a flattened injecting-nozzle, *g*, which is directed towards the rear end of the retort. When coal is used in retorts, the diaphragms *d* are omitted. A regulating-cock, *e*, is applied to each branch pipe *c*. E, a pipe from the bottom of reservoir C, and provided with a regulating-cock, *f*. From E descend branch pipes, *k*, which communicate with the branch pipes *c* just above the cocks *e*, and which are provided with regulating-cocks *i*. J designates small pipes, which communicate with the pipes *c* opposite the lower termini of the oil-supply pipes *k*. Pipes J are provided with cocks *n*, and supply coal-gas to retorts A. They communicate with a gas-tank. K, stand-pipes, which are water-sealed in trunk L, and which communicate with retorts A. These pipes *k* carry off the gas for consumption.

When the retorts are properly heated, steam from the boiler B is admitted into them. The oil-supply cocks are then opened, when the steam current will compel the oil to flow into the retorts through the nozzles *g*. The gas-cocks are then opened, and a supply of coal-gas is carried along into the retort.

I thus effect a mixture of hydrocarbon fluid, steam, and coal-gas in the lower ends of the branch pipes *c*, and forcibly inject this mixture, in the form of spray, into the retort, where it instantly flashes into a chemically-fixed gas.

The reservoir C is provided with a coil of pipe leading from the steam-generator B. I may thus use in reservoir C rosin, tallow, and other solid matters containing carbon.



IMPROVEMENT IN THE MANUFACTURE OF GAS.

A VERY rich deposit of gold has been struck in the Centennial Lode, near Laramie City, Wyoming. At a depth of 100 feet, a large body of quartz has been found, showing an amount of free gold which, it is believed, exceeds any thing ever before seen in rock. A large solid piece of this rock will be sent to the Centennial Exhibition.

IMPROVED FURNACES FOR TEMPERING STEEL.

By J. B. ARMSTRONG, Guelph, Canada.

THE invention has a double application in the art of heating steel for tempering: first, heating the steel uniformly to a stated degree before hardening in oil or any of the usual liquids; second, drawing or "letting down" the temper of steel after hardening, in the usual way, to a uniform degree.

Fig. 1, longitudinal section. Fig. 2, cross-section.

A, furnace, of brick; *a*, the usual grate. Over the furnace, the close retort D is placed, the bottom of the retort forming the roof of the furnace.

The walls, roof, and floor of the retort are constructed of fire-clay, fire-brick, or other suitable material, when the retort is used for heating the steel to harden; but when the furnace is to be used only for drawing the temper after hardening, a cast or wrought iron retort may be used, as a less degree of heat is required than in the former process.

E are flues, which take the flame, heated gases, etc., from the upper part of the furnace up one side, over the top, and down the other side of the retort, the heated gases, smoke, etc., escaping through suitable passages to a common vent. The flues E are narrow passages formed along the whole length of the retort, the intervening walls being thin partitions of fire-clay or cast iron.

The flues are so arranged that they take the draught from and deliver it at alternate sides of the furnace, thus equalizing the distribution of the heat over the whole surface of the retort.

F, blast-pipe, beneath and extending under the whole length of the furnace, the upper surface being perforated with holes *f*, of any convenient diameter, placed at a regular distance apart throughout the entire length under the furnace. Fitting within the pipe F is an inner revolving tube or damper, perforated with holes, at the same distance apart longitudinally as those in the outer tube, the only difference being that the holes are elongated in a transverse direction, and are cut to form a spiral on the inner tube.

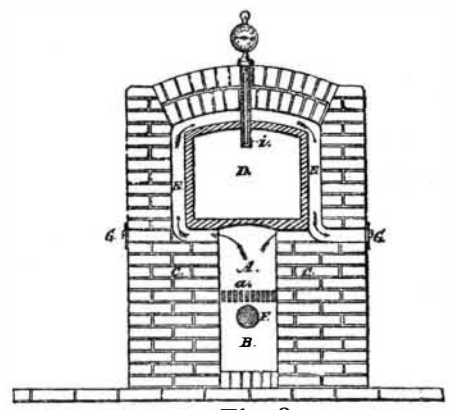
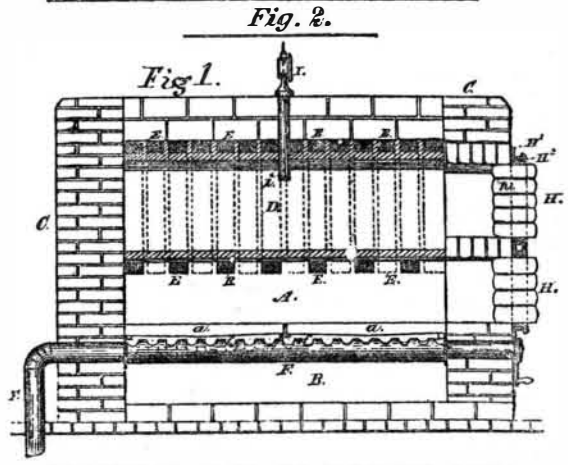


Fig. 2.



IMPROVED FURNACES FOR TEMPERING STEEL.

The object is to enable the operator to vary the position of the delivery of the blast, in order to equalize the heat in the furnace and retort. Thus he may give an equal distribution of the blast throughout the entire length of the furnace, or he may cut it off partially or entirely at one end, throwing the whole blast into the other end, or *vice versa*.

H H, furnace-doors hinged to frames H^1.

The doors consist of an open frame, of iron, H^2, filled in with fire-bricks *h*, the bricks fitting, when the door is closed, within the opening left in the brick-work. Thus no portion of the iron door or frame is exposed to the action of the heat. As the fire-bricks are burned away, they are pushed forwards again and again until consumed, when new bricks are inserted, as before.

I is a pyrometer, of the usual construction, fitted to the top of the retort in such a way that the expanding bar extends downward into the interior of the retort within an open guard-tube, *i*.

Suppose that the retort is charged with single-plate cast-steel carriage-springs. The operator watches the pyrometer, and, by manipulating the blast and blast-discharge, he is enabled to bring the whole of the contents up to without exceeding the proper degree of heat. Of course the thinner portion of the plates reaches that degree first; but they can go no higher than the degree indicated on the pyrometer, waiting, as it were, until the thicker portion has been thoroughly permeated, and the whole mass is in one uniform heat, when the springs are taken out and dipped.

In lowering or letting down the temper after hardening, the same operation is repeated, the operator knowing the particular degrees of heat which correspond to different tempers and working accordingly.

The advantages gained by my invention are: first, that steel of regular and irregular shapes and thicknesses can be raised to (without any portion being allowed to exceed) a uniform degree of heat in tempering; second, that the blast to the furnace can be applied equally or unequally during its whole length to suit circumstances; third, that by the application of the pyrometer the operator is enabled to gauge the heat in the retort, raising or lowering the temperature of the furnace accordingly, and, knowing the degrees of heat which give to steel certain tempers, he is enabled to turn out every charge to a known and exact temper.