

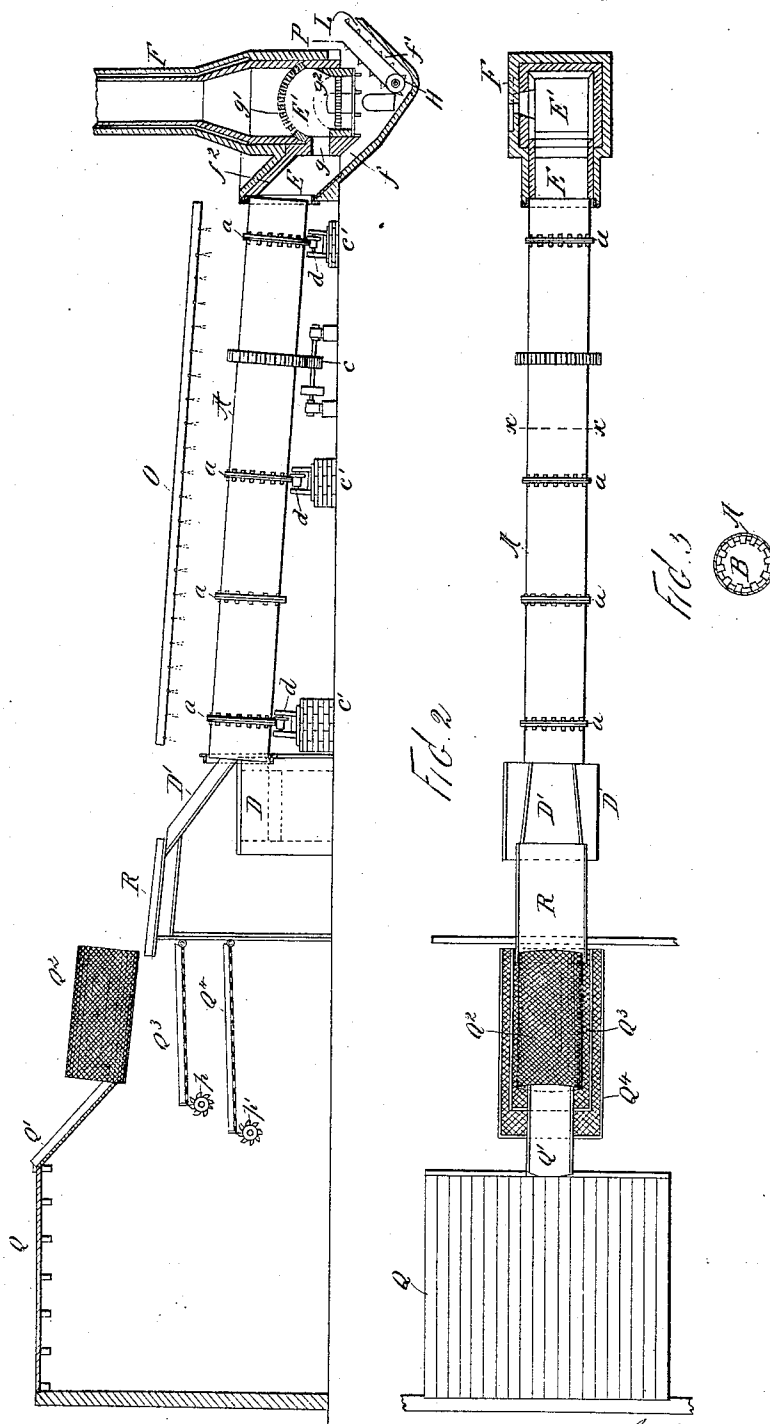
(No Model.)

J. J. STORER.

APPARATUS FOR TREATING THE REFUSE OF CITIES.

No. 481,680.

Patented Aug. 30, 1892.



Witnesses:
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UNITED STATES PATENT OFFICE.

JACOB J. STORER, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO MARY L. STORER, OF SAME PLACE.

APPARATUS FOR TREATING THE REFUSE OF CITIES.

SPECIFICATION forming part of Letters Patent No. 481,680, dated August 30, 1892.

Application filed March 18, 1891. Serial No. 385,500. (No model.)

To all whom it may concern:

Be it known that I, JACOB J. STORER, a citizen of the United States, and a resident of East Orange, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Furnaces and Apparatus for Treating the Refuse of Cities, of which the following is a specification.

This invention is designed as an improvement on my furnace and process for manufacturing fertilizers, patented to me in the United States January 28, 1873, numbered 135,383, and March 18, 1873, numbered 136,943; and it consists in some important improvements in the construction of the furnace, in matters affecting its durability and efficiency, and in combining with it certain necessary mechanisms for adapting it to the most effective and economical treatment of the refuse of cities, all of which will be hereinafter fully set forth.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a partly sectional side elevation of my improved apparatus. Fig. 2 is a plan of the same. Fig. 3 is a sectional view of the cylinder on line X X, Fig. 2.

The problem of treating the refuse—the garbage, ashes, and street-sweepings—of cities is much more complex than that of treating the refuse animal-matter of slaughtering and packing houses and like establishments for conversion into fertilizers. The materials from such establishments require no separation from each other and are all adapted and utilized for fertilizers. The refuse of cities, on the other hand, embraces rags, paper, glass, tin cans and other articles of metal, partly-burned coal, and other substances which cannot be converted into fertilizers and which have special values of their own in various manufactures. For economically disposing, then, of a city's refuse these components thereof must be separated from each other and from the animal and vegetable components before the latter are dried or cremated; and as it is an object, especially in large cities, to have as few garbage-cremation

stations or plants as possible, in order to economize room and to have the work done as promptly and quickly as may be, in order to prevent any possible accumulation of the refuse and to prosecute the work without offense to the neighborhood and with economy to the city, it is requisite that the apparatus should be simple in construction, durable, capacious, and capable of being operated chiefly with unskilled labor, and that the process shall absolutely prevent the escape of malodorous gases into the air.

In my patents above referred to I describe a revolving cylinder constructed of boiler-iron and lined with fire-brick or other suitable refractory substance. That cylinder was formed of boiler-iron plates and was very costly, and often as it became heated during the process of the manufacture of fertilizers it expanded to such a degree that portions of the brick-lining would become loosened and fall out, thereby rendering necessary a stoppage of the work and causing considerable expense and trouble, so that it became apparent that continuous work in the fertilizer establishment could be assured only by a duplication of the cylinder and accessories, so that one set could be used while the other was under repair.

My present cylinder A is preferably constructed of cast-iron in cylindrical sections, flanged on their ends and bolted together, as shown at *a*. The fire-brick lining B is preferably made, as shown in Fig. 3, with some bricks or rows of bricks projecting inward beyond the others for the purpose of causing a better agitation and distribution of the garbage, &c., within the cylinder when it is revolving for giving said garbage a more thorough and prolonged exposure to the hot air and flame passing through the cylinder. When the projecting bricks of the lining are set in spiral lines, they serve to assist in the discharge of the dried or cremated material at the exit end of the cylinder. The cylinder may be revolved by means of belt, chain, or gear, preferably by spur-gear, as indicated at C, and it is supported in position and so as to revolve with but slight friction by flanged friction-wheels *d*, fixed in suitable standards on the cylinder-supporting frame or piers C' 100

and bearing against the peripheries of the cylinder-section flanges a , which are trued off for that purpose.

At the feed end of the cylinder is the fireplace or fuel-combustion chamber D, above which is fixed a hopper D', through which the refuse-matter is fed into the cylinder A as the latter revolves. The lower or exit end of the cylinder is connected by a flue E with the gas mingling and combustion chamber E', located in the base of the smoke-stack F.

In operating under the patents above referred to it was found that the dried material delivered from the cylinder into the receiving-pit constructed for its reception could not be removed during the drying process without great interference with the uninterrupted and continuous operation thereof, as the opening of the door of the said pit for the removal of its contents cut off the draft of the stack and caused a severe reaction or puffing of the flame, smoke, and gases from the feed end of the cylinder, with the effect of endangering the safety of the building and the workmen. To obviate this, I excavate beneath the smoke-stack F a deep and narrow pit H, with the two sides that are parallel with the cylinder made perpendicular and with the other two sides sloped in opposite directions, the one f up to the lower edge of the exit end of the cylinder A and the other f' forming an inclined plane extending up to the ground-level in front of the smoke-stack. This pit H may be brick-lined throughout, and the upper portion of the incline f forms the bottom of the flue E, through which the gaseous products of combustion escape from the cylinder into the gas-combustion chamber E' in the base of the smoke-stack, an arch f^2 , extending from the cylinder to the stack, forming the top of said flue. The slope or incline f' also is arched over, so that it becomes the bottom of a tunnel I, whose exit is through the front wall of the smoke-stack at about the ground-level. The flue E communicates with the gas mingling and combustion chamber E' through a sufficient opening g , made in the smoke-stack. This chamber E', which occupies the base of the stack F, has for the floor of its ash-pit the roof of the pit H, the bricks of the chamber-roof being so laid that interstices g' —say three or four inches square—are left between them all for the upward escape of the final products of combustion, these interstices being of ample aggregate area for such purpose. The said roof is by preference made dome-shaped for the better radiation of heat inward and downward and for affording sufficient area for interstices or openings g' of the requisite number and dimensions.

When this apparatus is in operation, a good fire is maintained on the grate g^2 , and the walls and dome of the chamber E' are thereby kept at a high temperature. The heated gases and products of combustion and evaporation passing from the cylinder A into the

heated chamber E' there mingle and burn, their combustion and decomposition being greatly assisted and accelerated by their brief detention, caused by the perforated dome, by the radiation of heat therefrom, and by their passage through and contact with the highly-heated walls or sides of the many dome-openings. The resulting products, deprived of offensive odor, pass out at the top of the smoke-stack. To prevent undue expansion by heat of the cylinder A when in operation, I arrange above and in line with it a pipe O, having many small perforations on the under side. Water supplied to this pipe from a proper reservoir (not shown) will continuously drip on the cylinder, and by keeping it comparatively cool prevent it from expanding to such a degree that the brick lining will become loosened.

For the working of this apparatus a fire is made in the fireplace D and urged until by the entering flame the cylinder has become sufficiently heated—say to a bright red or white heat—the cylinder being slowly revolved during this time that it may be heated more evenly. When the cylinder has become hot enough, the material to be dried or cremated is fed into it while it revolves through the hopper D'. The time occupied in the movement of this material from the feed to the discharge end of the cylinder may be regulated by the inclination of the cylinder, the pitch of its interior spirals, or by the speed of its revolutions, or by all or any of these causes combined, and they are easily controlled, so that the material fed into the cylinder shall be sufficiently dried or cremated before it is discharged. The dried material or ashes discharged from the cylinder fall down the incline f into the deepest part of pit H, whence it is best removed by the continuous operation of a bucket-elevator P, that runs in the narrow tunnel I, and will deliver its contents into any receptacles arranged to receive them. Thus the operation of the device, the introduction of the material into the cylinder, the discharge of the dried material or its ashes from the cylinder into the pit, and the removal of the latter from the pit may be constant and continuous.

When establishing a plant for treating city refuse, I erect a platform Q for the carts bringing the refuse on a level considerably above the head of the cremating-cylinder A, and between the platform and cylinder and in combination with them I arrange suitable apparatus to facilitate the separation one from another of the components of the refuse. In Figs. 1 and 2 is shown an arrangement of screens, shaking-table, and chutes suitable for the purpose. From the platform Q the refuse dumped on the chute Q' will fall into the capacious revolving screen Q², which will have meshes sufficiently large to permit the passage through them of the ashes, coal, and all material of less than, say, from four to six

inches in diameter. What passes through the meshes of this revolving screen falls upon the finer flat screen Q^3 , and what passes through the screen Q^3 falls upon the still finer screen Q^4 , both of which are designed to be continuously shaken by means of cams or toothed wheels $p p'$ or by any other suitable mechanism. At each of these screens $Q^3 Q^4$, I place one or two boys, whose work will be to gather from them what coal, rags, iron, glass, bones, and other merchantable articles may be on them, and the residuum that will fall to the ground below will be found to be as suitable as gravel for filling low lands, for the alkalis in the ashes will prevent the putrefaction of the small percentage of animal and vegetable substances in this residuum. In the meantime by far the greater portion of the animal and vegetable matter and the tin cans, metals, rags, paper, and larger bones will be discharged from the lower end of the revolving screen upon the table R, at the sides of which will be a gang of men armed with hooks, who will pick out these merchantable articles and deposit them in convenient baskets or other receptacles and push the residuum from the said table down into the hopper D' into the cremating-cylinder A, where it will be dried or converted into ashes, as may be desired, becoming in either condition inoffensive to the nostrils and suitable for fertilizing or filling land.

I do not confine myself to this special arrangement of screens, shaking tables and chutes, it being evident that they may be arranged in other effective and equivalent ways.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a furnace and apparatus for treating the refuse of cities, the combination, with the revolving furnace and the smoke-stack, having a gas-combustion chamber with a perforated roof in its base, substantially as herein shown and described, of a pit with two perpendicular and two sloping sides beneath said

combustion-chamber, designed for the continuous reception of the dried or cremated material continuously delivered from the furnace, and an elevator for continuously removing said material from said pit, substantially as set forth.

2. In a furnace and apparatus for treating the refuse of cities, the combination of a revolving screen Q^2 , a sorting-table R to receive the material passing over the lower end of said screen, the shaking and sorting screens $Q^3 Q^4$, arranged below said revolving screen to receive the material that passes through the meshes of the revolving screen, and the revolving cylinder-furnace A, set below the lower end of the sorting-table R to desiccate or cremate the material passing over the lower end of said table, substantially as described.

3. In a system designed for the cremation of the refuse of cities, the combination of suitable mechanisms embracing revolving and shaking screens and shaking table for receiving and separating the component parts of the refuse, mechanism for delivering the garbage into the cremating-cylinder, a brick-lined revolving cylinder-furnace set nearly in a horizontal plane, a fire-box at the head of the furnace for delivering heated air and flame into the interior of the same, a gas-combustion chamber with perforated dome in the bottom of the smoke-stack opposite the lower end of the cylinder, a pit beneath the smoke-stack for continuously receiving the cremated garbage as it falls from the furnace, and an elevator for continuously removing the contents of said pit, all arranged and operated substantially as herein shown and described.

Signed at New York, in the county of New York and State of New York, this 11th day of February, A. D. 1891.

JACOB J. STORER.

Witnesses:

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EDWARD A. BALDWIN.