

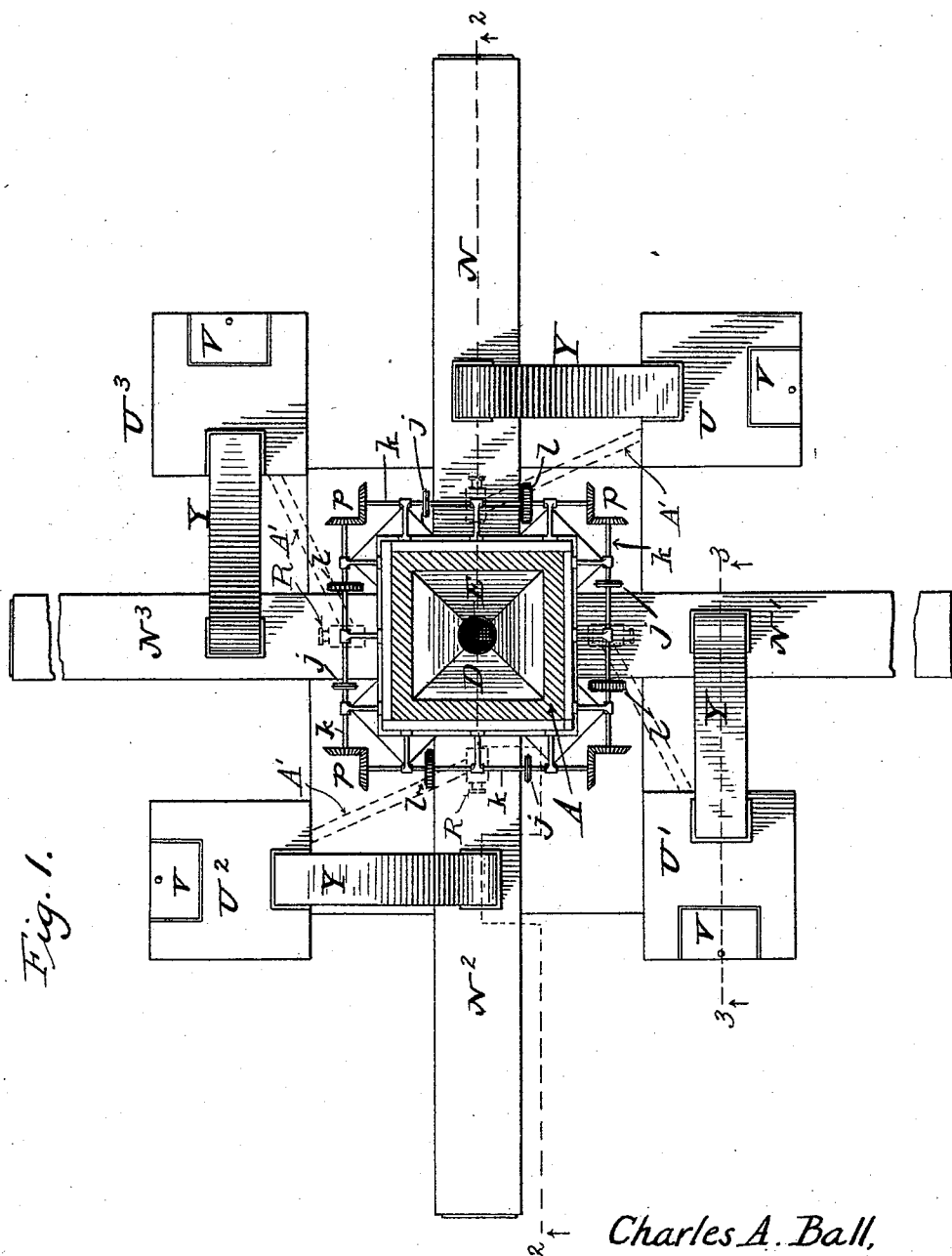
(No Model.)

5 Sheets—Sheet 1.

C. A. BALL.
APPARATUS FOR TREATING GARBAGE.

No. 529,236.

Patented Nov. 13, 1894.



Witnesses
C. B. Burdine.
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(No Model.)

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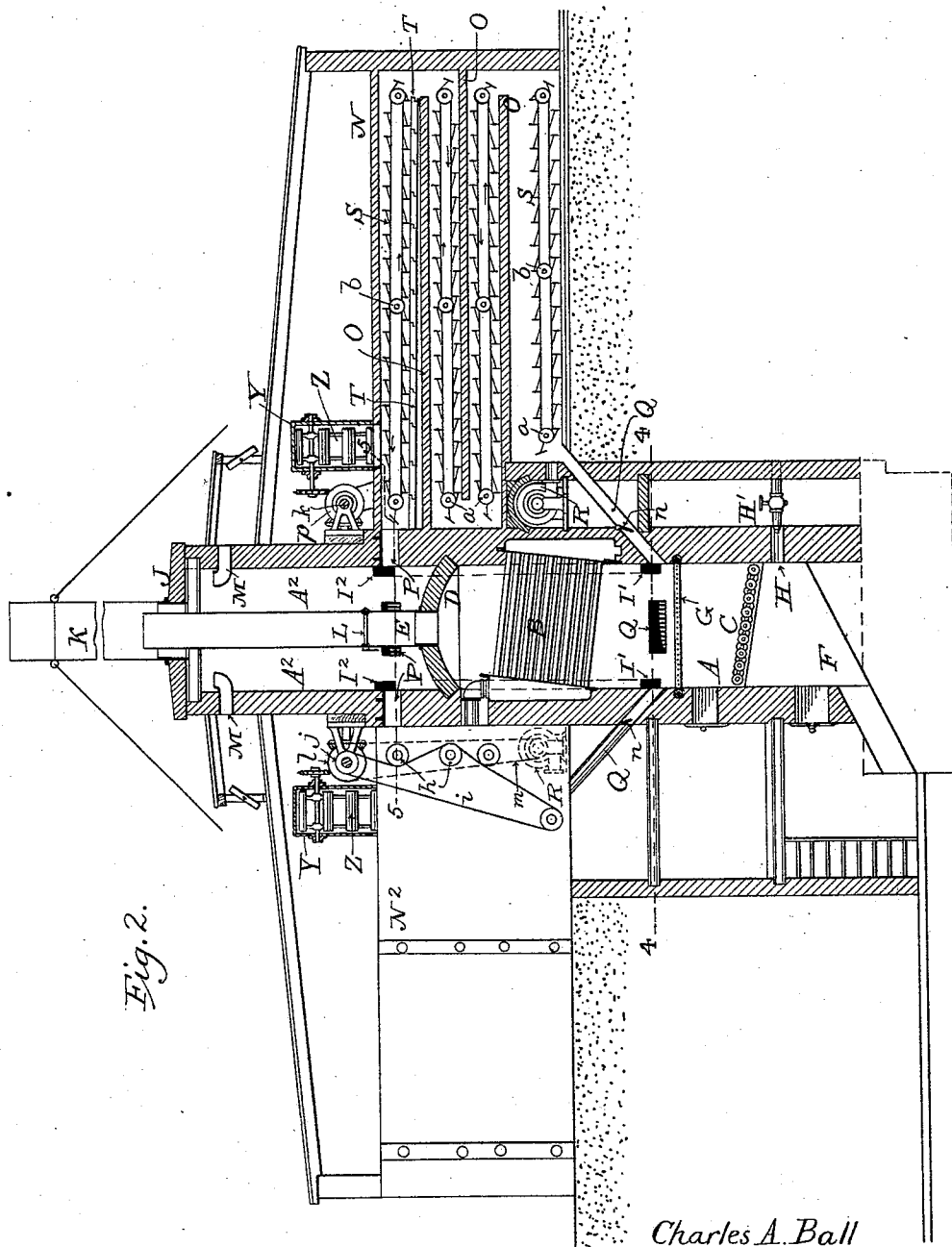


Fig. 2.

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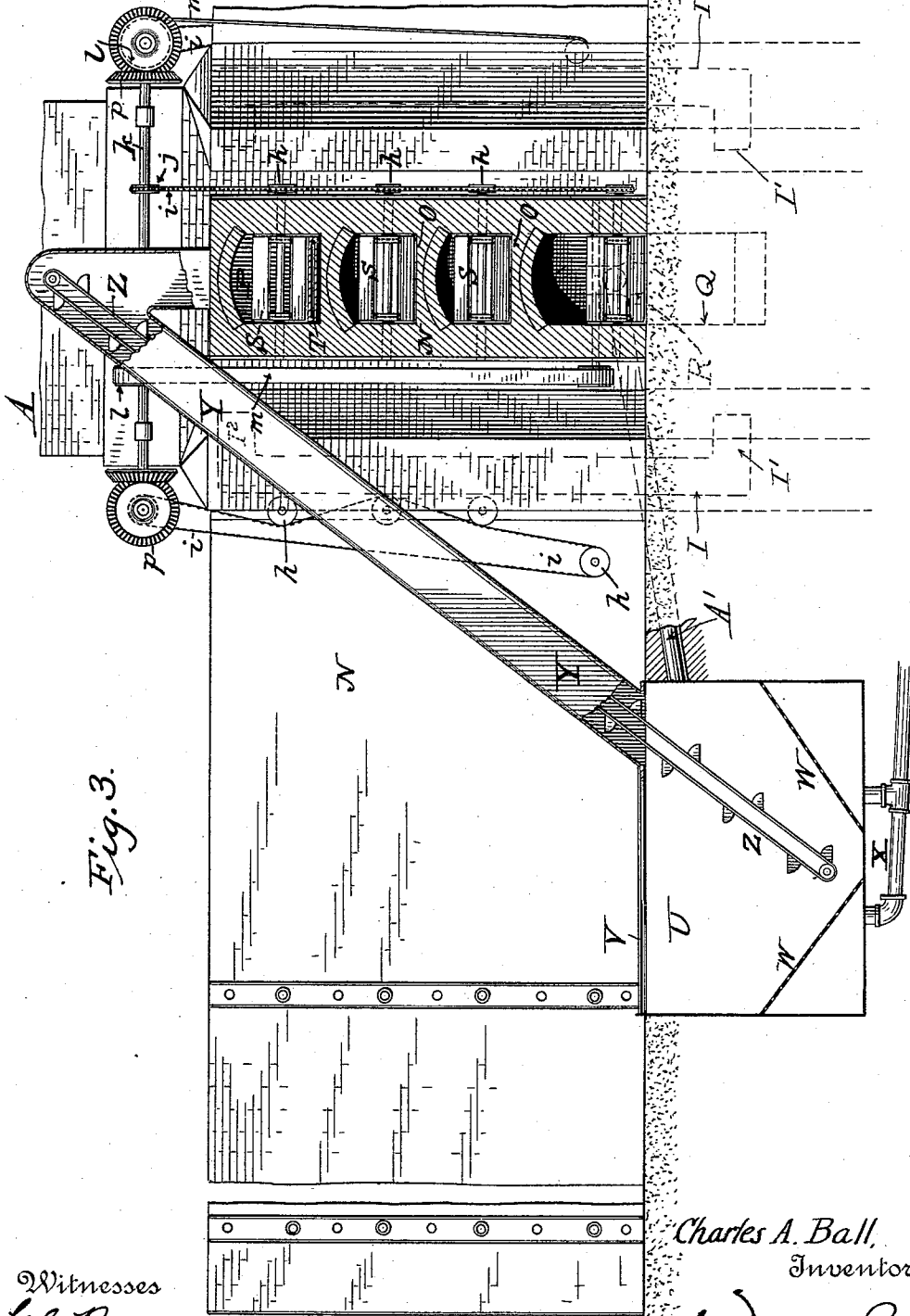
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Fig. 4.

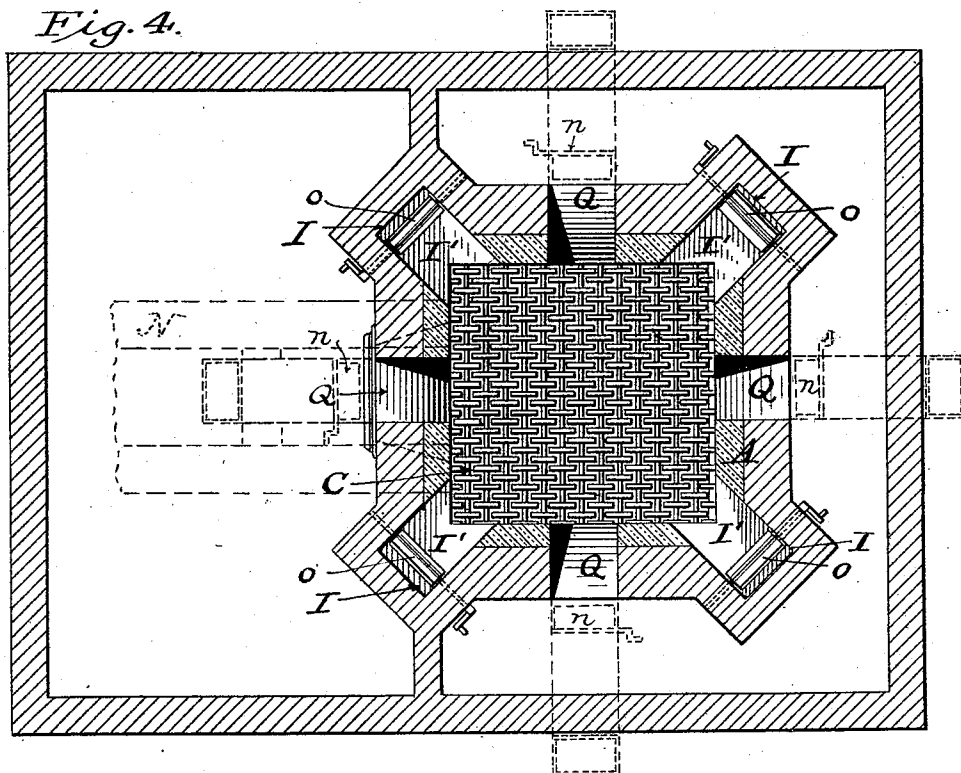
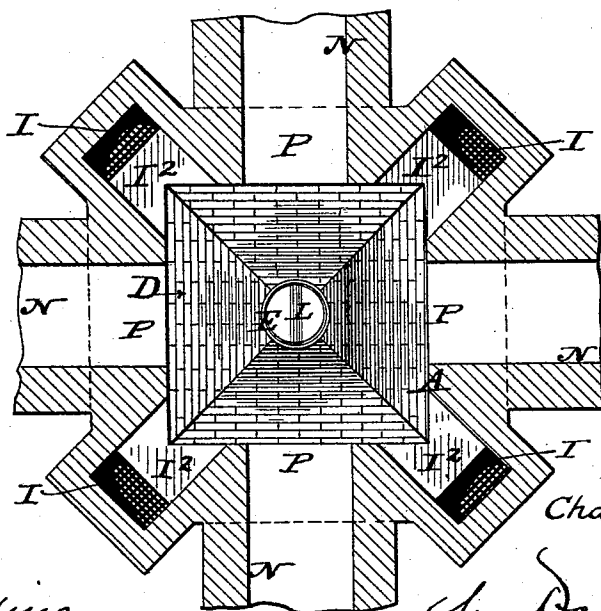


Fig. 5.



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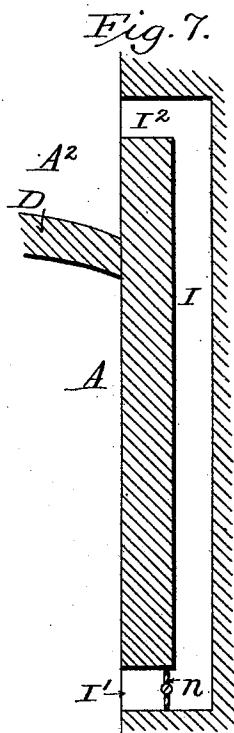
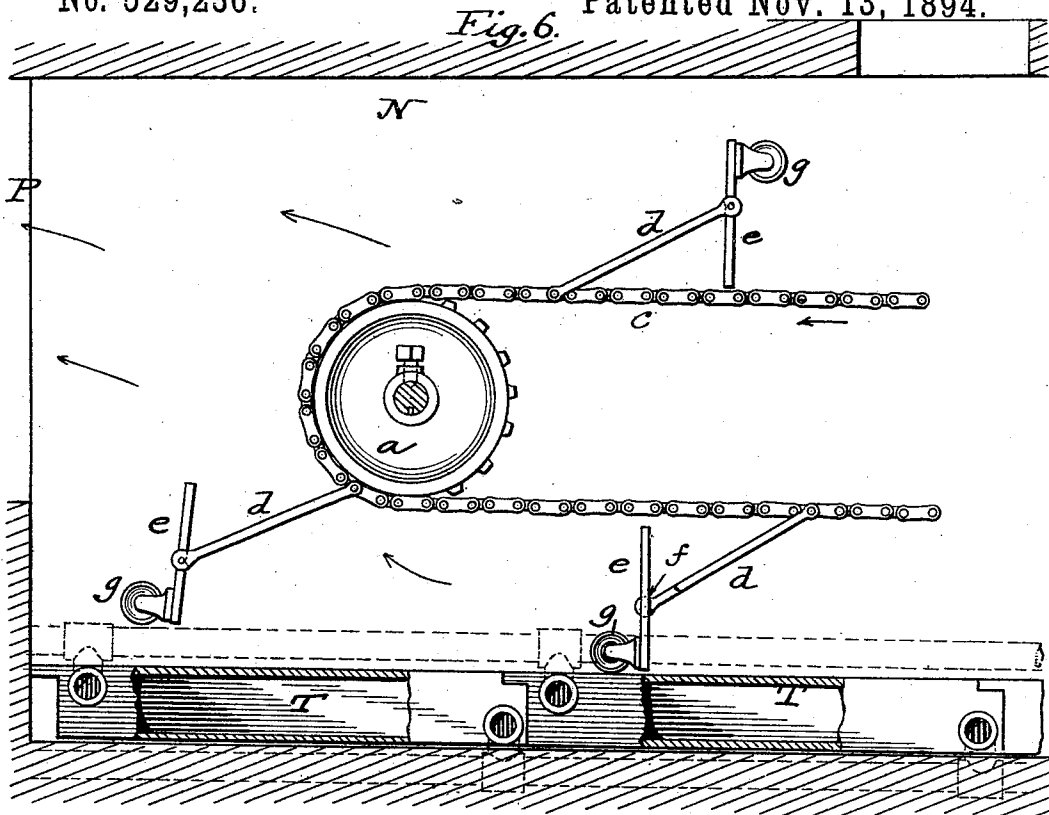
(No Model.)

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C. A. BALL.
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UNITED STATES PATENT OFFICE.

CHARLES A. BALL, OF WASHINGTON, DISTRICT OF COLUMBIA.

APPARATUS FOR TREATING GARBAGE.

SPECIFICATION forming part of Letters Patent No. 529,236, dated November 13, 1894.

Application filed April 27, 1894. Serial No. 509,175. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. BALL, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Treating Garbage, of which the following is a specification.

My invention relates to the treatment of garbage, and refuse matters generally, and has reference more particularly to an apparatus by means of which the garbage or refuse is first thoroughly dried, and then burned in a furnace.

In constructing an apparatus for disposing of the garbage collected each day in cities, there are several points that are necessary to be considered. In the first place, the apparatus must be so arranged as to require as little handling of the garbage as possible; secondly, the escape of offensive odors must be prevented, both while the garbage is stored preparatory to final disposition and also during its treatment; thirdly, the treatment of the material should be practically continuous and expeditious; and, fourthly, the apparatus must be simple in construction and capable of operation with little power and expense.

I have devised an apparatus for the treatment of garbage and refuse, capable of effectively disposing of, say, one hundred and fifty tons of material a day; and which possesses the requisites of a thoroughly successful plant.

In the drawings,—Figure 1 is a general plan view of my apparatus, with the roof removed and with the upper part of the main stack in horizontal section; Fig. 2, a vertical sectional view on the line 2—2 of Fig. 1, with one of the drying chambers and the conveyers in side elevation; Fig. 3, a vertical sectional view on the line 3—3 of Fig. 1; Figs. 4 and 5, horizontal sectional views taken respectively on the lines 4—4 and 5—5 of Fig. 2; Fig. 6, a detail view of one of the endless carriers; and Fig. 7, a vertical sectional view through one of the upright corner flues.

A indicates the garbage-burning furnace, preferably rectangular in cross section, which is divided into two chambers,—a main combustion chamber, and a secondary chamber A²,—by means of an arched top or partition D.

In the main combustion chamber is a boiler B and a grate C both of which may be of most any desired construction; while from the arched top D projects a smoke stack E as shown in Fig. 2.

The furnace proper is provided with an ash pit F; suitable doors opening respectively above and below the grate; a perforated pipe G above the grate through which air is forced in fine streams so as to mingle with the products of combustion; and, finally, with an opening H below the grate to receive a blower, H', when it is desired to employ a forced draft, all as shown in Fig. 2.

At the corners of stack or chamber A, are upright flues I, Figs. 4, 5, and 7, which open at their lower ends into the combustion chamber at I', Figs. 2 and 7, and at their upper ends into the secondary combustion chamber A², as indicated by I², Fig. 4. Chamber A² is provided with a closed top J, from which projects a large pipe K, which in practice terminates at about one hundred feet above the ground.

The smaller stack or pipe E which is provided with a valve or damper L, projects upwardly a short distance into the lower end of the larger stack K, as clearly shown in Fig. 2, so as to deliver its gases, &c., into the large main stack above the outlets I².

In the sides of the chamber A², just below the top J, are air inlets M, Fig. 2, which deliver air into the chamber and cause it to commingle with and dilute the poisonous gases. The hot products of combustion emitted from pipe E, being delivered into the larger pipe K, create a strong draft up the latter, thereby insuring the delivery of all odors, &c., at such a height above the ground as to prevent their being noticed.

After the fire is well started upon the grate, the valve or damper L may be so regulated as to direct a suitable proportion of the products into the corner flues I and to deliver them from the latter into the secondary combustion chamber A² at the upper end of the chamber A so as to be thoroughly commingled with the gases, &c., given off by the material being dried.

Projecting laterally from the side of the fire chamber or furnace A is a chamber N in which the material is dried before being burned.

This chamber is provided with a series of shelves O, each terminating at a short distance from one end of the chamber, thereby forming openings alternately at opposite ends of the shelves, by means of which the material which is carried along one shelf may fall onto the shelf below. This chamber N communicates at its upper end by opening P with the chamber A², see Fig. 2, at a point above the arched top D, and it also communicates at its lower end by means of a pipe or flue Q with the main combustion chamber A, above the grate.

R indicates a fan or blower located near the base of the chamber N and adapted to deliver a strong blast of air into the said chamber at the bottom thereof, directly across the mouth of the pipe Q. This arrangement results in the production of a suction or draft up the pipe Q and the carrying into the chamber N of a portion of the products of combustion to aid in drying the material.

The shelves O of the chamber with the exception of the first, are made preferably of brick, over which work the endless belts or conveyers S, Figs. 2, 3, and 6, which are carried by sprocket wheels *a*, and supported between their ends by rollers *b*. The upper or first shelf in chamber N has a floor of iron radiator sections or boxes T, which will be connected with the exhaust-steam pipe leading from the engine (not shown) or with a pipe taking steam direct from the boiler; the purpose of placing radiators in the chamber being to effect a very rapid initial drying of the material. In practice I will make these shelves about twenty-five feet in length, and as there are four of them, the material will be caused to travel one hundred feet before it can enter the fire chamber.

It is essential not only that the vapor be expelled from the material under treatment, but that it be removed as soon as expelled, so as not to be reabsorbed; and this very important result I secure by highly heating the material as it first enters the chamber N, and by withdrawing the vapors as soon as expelled, by a current of air which passes in a direction the reverse of that taken by the material, the drying effect of said air current being augmented by the hot products of combustion drawn up through the pipe Q.

The conveyers S comprise ordinary sprocket chains *c* to which are pivoted, by means of links or arms *d*, the blades or flights *e* as shown in Fig. 6.

The arms *d* are provided each with a shoulder *f* with which the front face of the flight, at its ends, comes into contact when the flight is in working position, thus preventing the flight from tipping or rocking and passing over the material. On the rear face of each flight I place one or more rollers *g* which prevent the flights from resting upon the shelves.

U, Fig. 3, indicates the garbage receptacle, provided with a door V through which the

material is dumped, and an inclined perforated false bottom W which allows the water to drain off before the material is removed, the water escaping by means of a pipe X into a sewer. This box or receptacle is made substantially air-tight, and communicates by means of a closed trunk Y with the upper side of chamber N; said trunk inclosing an elevator Z which takes the material from the box or receptacle U and delivers it onto the uppermost shelf O without exposure to the atmosphere.

It will be noted, upon reference to Fig. 3, that the fan R shown in dotted lines is connected by means of a pipe A' with the box or receptacle, and hence when the dump-door is opened, the odors cannot escape from the box but will be forced into chamber N.

The shafts of the sprocket wheels *a* supporting and driving the conveyers S, will be provided outside the chamber N each with an additional sprocket wheel *h*, Figs. 2 and 3, which will be engaged by a chain *i* receiving motion from a wheel *j* on a shaft *k*. This shaft *k* will also be provided with a wheel *l*, from which motion is transmitted by belt or chain *m* to the fan-shaft.

From the foregoing it will be observed that the material dumped into the box or receptacle U will be drained of its water and then carried by the elevator Z up to the top of the chamber N. Here it is delivered onto the uppermost shelf O, having the radiator flooring where it will be heated and the moisture expelled. The conveyers S carry the material along the upper shelf O from the end of which it falls onto the shelf next below, where it is caught by the second conveyer and moved along the second shelf, this operation being repeated until the material reaches the bottom shelf from which it is delivered through pipe Q onto the grate and burned; the expelling of the moisture and the removal of the vapor or moisture expelled from the material being effected by means of the air blast issuing from fan R and passing through the chamber N, together with some of the products of combustion, in a direction the reverse of that taken by the material. By the time that the material reaches the grate it will be found to be thoroughly dry and in a condition for ready burning.

The air that passes from the material being dried carries off the gases and more or less dust, and this is delivered through the openings P into the chamber A² where it is mixed with the products of combustion delivered into the secondary chamber A² by means of the flues I. The mixing of these very hot gases, &c., with a regulated quantity of fresh air, in the chamber A² causes them to burn therein, and there is, therefore, no possible chance for odors to escape from the apparatus at any time during the treatment of the material.

I provide the pipe Q with a hinged valve

n, controlled in any suitable manner, Fig. 2, which, in connection with a regulation of the speed of the blower or fan R enables me to regulate to a nicety the temperature of the chamber N.

It is undesirable that a single chamber N be relied upon to dry the entire output, as it would necessitate a very large apparatus and throw too much strain and work upon parts that should not be subjected to such excessive work. Furthermore, if one chamber were relied upon, a stoppage for repairs would necessitate a stoppage of the entire work. To avoid this, I employ four independent chambers N, N', N², and N³ with their corresponding dump boxes U, U', U², U³ fans, elevators, &c., as shown in Figs. 1 and 2; and in order that the fans, conveyers and elevators may be conveniently driven by power derived from one engine, I employ four shafts k and connect them by bevel gears p, as shown in Fig. 1, the engine, which is not shown, receiving its supply of steam from the boiler B. Under this arrangement any one or more of the chambers may be used as desired. The consumption of the dried garbage will furnish the heat necessary for the generation of steam within the boiler.

The garbage gives off an intense heat when burned with a forced draft, but the flues I will carry off the excess of heat and prevent any racing or injury to the boiler; said flues being provided with dampers o.

In first starting the apparatus it will be necessary to employ ordinary fuel to generate steam in the boiler, but after the apparatus is ready for work, the damper L will be closed or partially closed, and the flues I opened. These flues I are made of an area in excess of the ordinary requirements in order that there may be no possibility of injuring the boiler, but by a proper regulation of the dampers in these flues and the damper in the smoke stack, relatively to each other, the supply of steam may be maintained with regularity.

Having thus described my invention, what I claim is—

1. In an apparatus for treating garbage, the combination with a furnace having a main combustion chamber, and a secondary chamber; of a pipe K extending from the top of the secondary chamber; a pipe E leading from the main combustion chamber to the lower end of pipe K; flue I opening at opposite ends into the main and secondary combustion chambers; and a drying chamber N communicating with the secondary combustion chamber.

2. In an apparatus for burning garbage, the combination with a furnace, having a main combustion chamber and a secondary combustion chamber; of flue I connecting the two chambers; a pipe E opening from the top of the main combustion chamber into the secondary chamber; a stack or pipe K extending from the top of the secondary chamber; and

a drying chamber N connected with the main and secondary chambers.

3. In an apparatus for burning garbage, the combination with a furnace having main and secondary combustion chambers; of the flue I connecting said chambers; a drying chamber N connected with the secondary chamber; and air inlets M opening into the secondary chamber.

4. In combination with a furnace provided with a smoke flue; an independent chamber to receive the garbage and in which the garbage is dried; a pipe independent of the smoke flue connecting the said chamber with the furnace; and means within said chamber for continuously moving and feeding the garbage to the furnace; whereby the products given off by the burning garbage are utilized to assist in drying the garbage.

5. In combination with a furnace provided with a main combustion chamber and a secondary combustion chamber; a garbage-drying chamber opening at its upper end into the secondary combustion chamber; a pipe for delivering the dried garbage into the main combustion chamber; a flue I for conveying a portion of the products of combustion to the secondary chamber; and means for forcing a current of air through the drier into the secondary chamber; whereby the drying of the garbage is facilitated, and the dust and gases carried to the secondary chamber where they are consumed.

6. In combination with a garbage drying chamber N; a furnace or chamber A in which the garbage is burned; a pipe or flue Q for delivering the dried garbage to the furnace; and a fan or blower R discharging air into chamber N across the mouth of flue Q.

7. In combination with a garbage drying chamber N; a furnace or chamber A in which the garbage is burned, and which is provided with main and secondary combustion chambers; a flue or pipe Q for delivering the dried garbage into the main combustion chamber; and a flue or opening P for delivering the vapors from the chamber N into the secondary chamber.

8. In combination with a garbage burning furnace provided with main and secondary combustion chambers; flues I for delivering a portion or the whole of the products of combustion into the said secondary chamber; a drying chamber N communicating at its lower end with the main combustion and at its upper end with the secondary combustion chamber.

9. In a garbage-burning apparatus, the combination with a furnace provided with main and secondary combustion chambers; of a drying chamber; and means whereby the products of combustion of the main combustion chamber are divided,—a part passing through the drying chamber to the secondary combustion chamber, and the remainder passing directly to the secondary combustion chamber.

10. In a garbage-burning apparatus, the

combination with a furnace provided with main and secondary combustion chambers; of a drier; flue P connecting the drier with the secondary combustion chamber; flue Q connecting the drier with the main combustion chamber; a valve *n* in the pipe Q; flue I connecting the main and secondary chambers and provided with valve *o*; and stack E applied to the main combustion chamber and provided with valve L, whereby the products of combustion from the main combustion chamber may be divided and controlled.

In witness whereof I hereunto set my hand in the presence of two witnesses.

CHARLES A. BALL.

Witnesses:

WALTER S. DODGE,

HENRY W. REED.