# SCIENTIFIC AMERICAN

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## GARBAGE CREMATING FURNACE.

The matter of cleaning the streets of New York and disposing of the collected refuse is still so prominently before the public that we offer no apology for presenting to our readers an illustration and description of another cremating furnace, which operates on a different principle from any of those that have been presented in our columns the past few months.

It appears that about a million loads, or 750,000 tons, of ashes, street sweepings, and garbage were collected in this city last year and thrown overboard, and the amount is annually increasing.

Not only does this method of disposing of the city refuse seriously injure the harbor and neighboring beaches, but it involves an inexcusable waste of material; hence it is evident that other methods must be adopted, and of these none appears to us so practical as cremation, which in this connection means the destruction of a fruitful source of disease, the conversion of a waste material to a valuable commodity, and the consequent annual saving to the city of thousands of dollars.

The advantages of cremation of city refuse have been fully demonstrated in several small towns in England and on the Continent, though the cremating plants there used are costly and of very limited capacity; but the most ardent advocates of cremation here have doubted the practicability of daily cremating 2,000 tons of refuse, which is the average amount collected in this city.

The city produces per annum about 800,000 loads of ashes, 225,000 loads of street sweepings, and 20,000 loads of garbage; but the ashes are so contaminated with garbage that they are unfit for any economic purposes. Were the garbage kept free from the ashes the amount of the former would be increased by about 25,000 loads. But this separation of the two is thought by the Board of Health to be practically impossible, and certainly no legislation to this effect can be enforced without great difficulty and constant and expensive legal proceedings.

It is clear, then, that for the first year or two, or until the citizens have learned to keep separate receptacles for the ashes and garbage, the 800,000 loads of ashes must be screened to reduce the garbage in it to about 2 per cent, or the amount that can be rendered harmless by the alkalies in the ashes, and the separated garbage cremated, or that the whole amount of ashes and garbage must be subjected to the action of fire.

The street sweepings can be used without any intermediate treatment for filling low lands, and the treated ashes are as valuable for such purpose as the best gravel.

In the suburbs of small towns isolated places can be found for the erection of cremation furnaces of any design, and they can be operated there without causing complaint; but such locations are available about large cities only at such distances that the hauling of the refuse to them would be practically impossible.

In such isolated places even cupola or blast furnaces for cremating may be unobjectionably operated, although they cannot consume their offensive steam and gases; for as the charge in such furnaces always burns from the bottom, the steam and gases from the superincumbent burning and drying mass escape into the air undecomposed, and with concentrated offense. Hence such furnaces would not serve in the neighborhood of crowded cities.

It is indispensable, then, if the cremation process be adopted, that an inexpensive furnace of almost unlimited capacity must be devised, capable of working continuously and with great rapidity, and of consuming or decomposing the steam and gases that are generated in the process.

A furnace apparently fulfilling these conditions is shown in the accompanying illustration. It consists of a brick lined cylinder, 60 feet long or thereabouts, and 6 feet in diameter, set at an inclination of about half an inch to the foot, on anti-friction rolls, and revolved by worm and wheel. At the feed end of the cylinder is a small fireplace that is used only for the ignition of the pulverized fuel, which is the principal agent in this work, and for which the inventor of this furnace holds the only United States patents. At the delivery end of the cylinder is shown a receiving chamber or pit (the parts being broken away for this purpose), into which the dried material falls, and whence it is continuously removed by a bucket elevator.

Just beyond this pit, in the base of the smokestack, is the gas mingling and combustion chamber, in which the escaping steam and gases are decomposed and thereby rendered inoffensive.

The operation of the furnace is as follows: The fire is urged in the first fireplace until the latter is hot enough to instantly ignite the pulverized coal which is injected through it by the pulverizer or fan, as shown in the engraving. The jet of burning pulverized coal entering the cylinder quickly heats it throughout to a white heat. At the same time the fire on the grate in the gas combustion chamber has brought the walls and perforated dome thereof to a white heat.

The cylinder is then put in motion at the rate of from two to ten revolutions a minute, and the garbage and ashes separately or together, are dumped into it from the carts.

The material, as it passes through the cylinder, is exposed to the direct contact of the intense flame and to the direct radiation from the hot brick lining of the cylinder for as long a period as may be desired, this depending upon the speed of the cylinder.

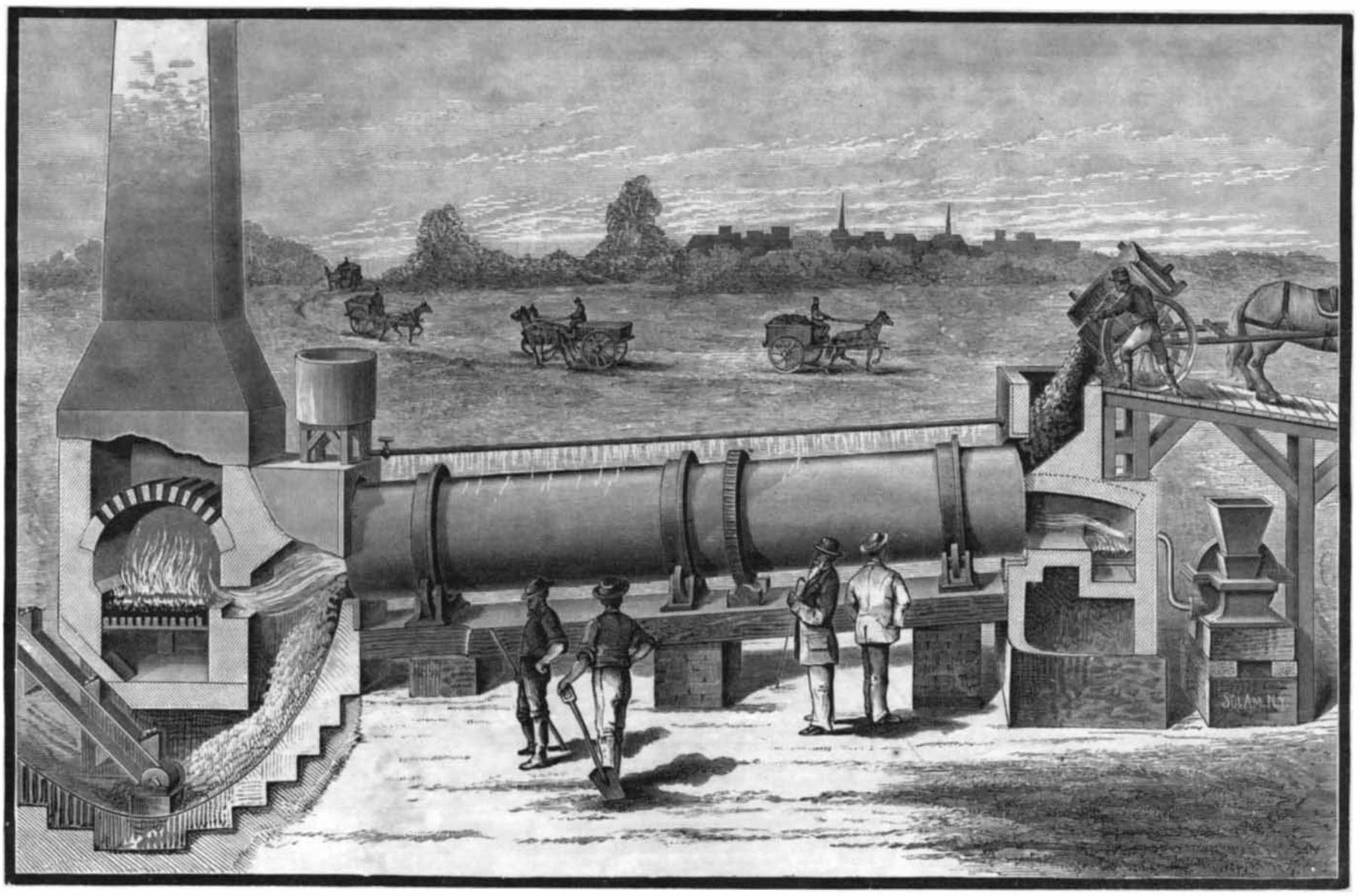
At a speed of about five revolutions a minute the furnace will dry the garbage to the best condition for a fertilizer, while at a speed of two revolutions a minute for the furnace the garbage will be reduced to ashes. The speed is regulated at will by the use of cone pulleys on the countershafts.

The enormous volume of steam and gases generated in the process move forward into the gas combustion chamber, and are there decomposed and burned, the perforated dome retaining them sufficiently long for this purpose.

There escapes then through the dome an intense white flame of sufficient volume to generate steam for all the purposes of the work; not the slightest offensive odor escaping.

A drip pipe discharges a constant spray of water on the cylinder to prevent the expansion thereof, so that the brick lining shall not become loose.

The illustration shows the smokestack constructed of



STORER'S GARBAGE CREMATING FURNACE.

brick above the gas consuming chamber; this construction is preferable for furnaces erected on land; but for those on barges an iron stack is better.

One cylinder, 60 feet long and 6 feet in diameter, will reduce to ashes each day the daily production of garbage in New York, or over 250 loads per diem, and the cost of it, complete with all its auxiliary parts and the engine to run it, will not exceed $12,000.

Two smaller furnaces on barges—one for the North and one for the East River—would dispose of all the city garbage, even if the garbage and ashes were separated, at a cost of plant not exceeding $25,000; and a still smaller one, erected on a barge, could be used for cremating dead animals, condemned meat, mattresses and clothing from emigrant ships and hospitals, etc., and could easily be removed about the harbor to any places where its services were required.

This furnace and the application of pulverized fuel, by which alone it could be operated, are covered by many patents that are controlled by the inventor.

For further particulars address Jacob J. Storer, Post Office box 773, New York.

### Magnetic Separation of Iron Sand.

One of the American contributions for the Electrical Exhibition at Paris is a modification of Mr. Edison's magnetic separator for the treatment of iron sand found in large quantities on the south shore of Long Island and in other localities on sea coasts. According to Mr. Batchelor's statement to the *Evening Post* the Long Island sand contains 26 per cent of the finest iron known. Innumerable attempts have been made to separate the sand, and magnetic plates have been used before, but with no success on account of the presence of what is known as titanite iron, a substance which spoils iron. Edison discovered that titanite iron was less magnetic than the pure iron particles, and constructed his separator with that fact in view. The sand falls a distance of four feet in a thin stream from a slit in a V-shaped box holding about a ton. Under this box is a receiver divided into two compartments, the dividing partition being placed nearly under the slit in the sand reservoir and parallel to it. If no magnet is brought into play the sand all falls into one side of the box; but when a powerful magnet is brought near enough to act upon the falling shower, the pure iron particles are deflected in their fall and fly on the other side of the partition. The particles of titanite of iron are not attracted equally with the iron and are not deflected sufficiently to fall into the compartment with the pure iron. A company has been formed for the extraction of iron from Long Island sand, and is now at work with its first machine at Quogue, near Moriches, on the Great South Bay. This machine, which cost $700 to make, is managed by one boy, who keeps six men and two carts busy bringing sand for his hopper. It treats one hundred tons of sand a day, producing about twenty tons of pure iron, costing one dollar a ton to produce and selling for six dollars.

### The British Patent Laws.

In the House of Commons, June 15, the Right Hon. Joseph Chamberlain, President of the Board of Trade, speaking on behalf of the Government, expressed his approval of the principle of a bill introduced by Mr. Anderson (Advanced Liberal), member for Glasgow, for amending the patent laws in the sense of a large reduction in fees and the extension of the time of patents, in imitation of the American system. He said the Government would be glad to legislate upon the subject at the earliest possible moment, but it would be impossible to do so at this session of Parliament. All the speakers on the subject dwelt upon the effect of the American patent system in fostering inventions.

### The Increasing Cost of Paupers and Criminals.

The California Legislature recently published a report prepared by Chancellor Hartson, of Napa, Chairman of the Committee on Prisons, which contain some startling statistics. The cost of maintaining criminals and paupers is shown as follows:

| | |
|---|---|
| 1850—Population of United States | 23,191,876 |
| Criminals and paupers annually | $2,954,806 |
| 1860—Population of United States | 31,443,321 |
| Criminals and paupers annually | $4,445.143 |
| 1870—Population of United States | 38,558,374 |
| Criminals and paupers annually | $10,980,429 |

It is calculated that the census for 1880, when completed, will show an outlay of over $20,000,000 per annum for the cost of maintaining criminals and infirm people. This does not include the enormous outlay occasioned by the arrest and trial of criminals, but simply to their maintenance in prison.

PROFESSOR CHARLES E. MONROE, of Annapolis, states that the ordinary fruit acids, such as those contained in apples, tomatoes, rhubarb, lemons, etc., all acted upon tin. Some cider which he examined, and which had been stored in a tin fountain, contained one hundred and seventeen milligrammes of metallic tin to the liter in solution. One case was given where persons eating fruit preserved in tin cans were made violently sick, and tin only was found in the fruit. Corrosion of tin pipe by water was referred to, and it was suggested that the corrosion was due to the vegetable acids in the water.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### BOILER EXPLOSION NOTES.

The engravings of the boiler explosion at Messrs. Gaffney & Co.'s works, Philadelphia, not being ready, we are obliged to postpone them, together with our report, until our next issue.

We made a brief allusion last week to the peculiar finding of the coroner's jury in the above case. The explosion, it will be remembered, took place June 1st; the boiler was one of a nest of three, of cylindrical form, placed side by side, each 30 feet long and 36 inches diameter, with flat cast iron heads of the usual construction.

The jury found that the explosion was due to the improper use of cast iron in the flat head of the boiler; they also considered that the Hartford Boiler Inspection and Insurance Company was especially censurable for the incompetence and negligence of its agents who inspected and certified to the safety of the boiler; and they urgently recommended that the proper authorities take measures to prevent the recurrence of so terrible a disaster.

On the list of the jurors we find the names of J. B. Fontaine, of Fontaine, Abbott & Co., machinists; N. W. Williams, President of the Keystone Council, engineer; Samuel R. Marshall, formerly of the Wilkesbarre, Pa., Machine Works; J. Shield Wilson, Superintendent of Neafie & Levy's Penn Boiler Works, Kensington; Arthur Orr, of the firm of Orr, Hess & Co., machinists; and J. W. Nystrom, civil engineer.

We shall examine the subject more fully hereafter, and will now only remark that the facts, so far as gathered by us, strongly indicate that the jury rendered an erroneous verdict, and did not avail themselves of the means at their hands to verify practically the correctness of their conclusions. This is the more to be wondered at, because the gentlemen composing the jury were more than ordinarily qualified to make a searching investigation, and place before the public a full and correct explanation of the causes of the disaster. Any reliable information thus disclosed would be of importance to the "proper authorities" and to steam users in general.

The jury assign no reasons and point to no facts to warrant their verdict. From all the information we can gather it seems pretty certain that the explosion was due to an overpressure of steam, perhaps caused by inoperative safety valves and closing of the steam stop valves leading to the other boilers and to the dye works. It is, we believe, undisputed that most of the stop valves examined after the explosion were found to be closed.

Here were three boilers, all substantially alike, all having flat cast iron heads, all recently inspected and certified as safe. One of them, the newer and better boiler, explodes; the other two remain in their places intact and as capable, apparently, of useful service as ever. The jury had the opportunity of submitting the remaining boilers to a thorough test, and of determining on the spot, in the most convincing manner, whether the inspectors whom they complain of had really been remiss in their duty, and whether the jury's notion that flat cast iron heads are unsafe, was really correct. The omission of so obvious a duty detracts greatly from the value of the jury's finding, and makes it look as if they simply jumped at a conclusion.

Flat cast iron boiler heads are used on hundreds of boilers in all parts of the country, and many years of trial have proved them to be safe and serviceable. They generally stand better than the wrought iron parts of the boiler. While it is true that the concave cast head is the stronger form, and is preferable, still it was absurd for the Philadelphia jury to alarm their neighbors by proclaiming that all flat heads are unsafe. They should first have tested and demonstrated the truth of the matter.

As for the Hartford Company it has rendered invaluable service to steam users in the past; its agents and inspectors enjoy the reputation of being competent, reliable men, unlikely to make gross blunders in their inspections or certificates; and in the absence of the practical tests which the jurors might have made, their censure is of little account.

On the 10th of June another disastrous boiler explosion took place at Pottsville, Pa., in the large rolling mill of Atkins Brothers. Three persons were killed and six or more scalded. The exploded boiler was of cylindrical form, 26½ feet long, 30 inches diameter, with a flat cast iron head. Thirty-eight other boilers of similar pattern are used in this establishment, and all unite to form one general steam system, by which the blowers, the rolls, and other machinery of the concern are driven. All the boilers are heated by the products of combustion that rise from the puddling furnaces; the boilers being suspended over the furnaces by arched girders. Each end of each boiler is suspended by hook and staple to the girder. The exploded boiler broke completely in two at a point five or six feet distant from its front end, where the products of combustion first impinge upon the boilers, and where there are the greatest alternations of temperature, due to the opening and closing of the puddling furnace doors. We are preparing engravings and a full report on this occurrence, which we shall shortly publish. According to the theory of the Philadelphia jury the flat cast iron head ought to have blown out—but it did not.

On the 12th of June the boiler of the large and powerful wrecking steamer, B. & J. Baker, of Norfolk, Va., exploded when the vessel was near Cape Henly. Three persons were killed and several badly injured. The boiler was of cylindrical form, with return tubes, containing two tubular furnaces, the tubes of steel 28 inches in diameter. The boiler was 16 feet long, 7 feet diameter. The explosion is believed to be due to corrosion of one of the steel tubes which collapsed. We are preparing a report with engravings which will soon be published.