## DISPOSAL OF THE WASTES OF NEW YORK CITY.

Among the many operations which may be classed under the head of sanitary engineering, or are closely allied thereto, the question of the proper disposal of city refuse is occupying just now the foremost place. Its prominence is due to its vast importance and to the fact that it is the latest problem affecting the public health and the city revenues that is being attacked on thoroughly businesslike and scientific lines.

The present article is devoted to the subject of the disposal of the third class of city wastes, officially known as "paper and refuse." What this includes can best be understood by referring to the printed instructions upon the back of the red, diamond-shaped cards which the Street Cleaning Department distributes among the householders to be hung up as a signal that the "paper and refuse" man is to call on his next round. The instructions give a list of a dozen articles which must not be placed in either the ashes or the garbage receptacle, but are to be tied in a separate bundle or placed in old barrels or boxes for collection. The list includes such articles as bottles, rags, old clothes, all kinds of paper, shoes, carpets, leather and rubber scrap, etc. The "et cetera" includes the worn-out product of almost every textile and mechanical trade that ministers to the wants of a household, and the contents of the paper and refuse carts as they are dumped in on the assorting tables reveal a bewildering variety that must be seen to be appreciated.

LOWER END OF SORTING TABLE NEAR THE FURNACE.

If the average citizen were to inspect a pile of this rubbish and were asked to appraise its value, he would probably write it down as worthless; and it is certain that he would never imagine that, even in the days of Tammany rule, the privilege of sorting over the city refuse for one year brought in $90,000 to the city treasury. Still greater would be his surprise to learn that an official estimate of the value of the principal materials collected from the New York dumps places the total at $234,377 per annum.

Now, although, as these figures prove, the household rubbish contains much material that is salable, there will, of course, be a residue that is worthless or, to speak more truly, unmarketable. As this residue cannot be sent to the garbage works, and is not available like ashes for filling purposes, in any scheme of the city for handling "paper and refuse" it was necessary to find some other and suitable means for its disposition.

The plant which forms the subject of our front page illustrations was built for the purpose of enabling the city to sort its own refuse and turn the unsalable residue to account by using it as fuel in a steam generating plant. It consists of a movable sorting table on which the salable material is recovered, and a steam generating destructor in which the residue is completely burnt up, the combustion serving to generate more than sufficient steam to furnish motive power for the plant.

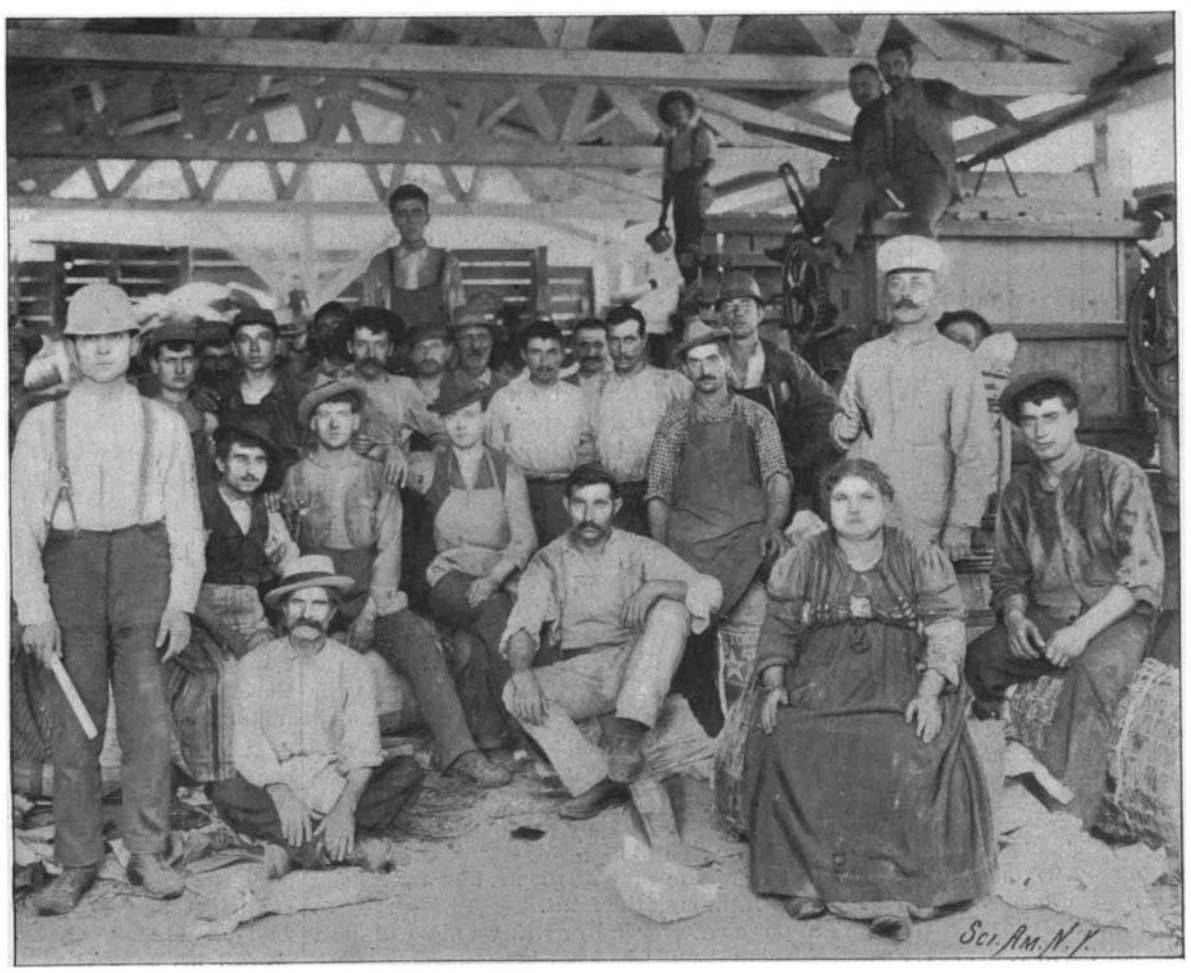
The sorting table consists of an endless canvas belt, 4 feet wide, which travels at a speed of 40 feet a minute above a table which is ranged down one side of the sorting room. The table is about 3 feet above the ground and extends from the dumping hopper, where the rubbish is unloaded from the carts, to the foot of the furnace—a distance of about 80 feet. Here the belt passes over a pulley and returns to a similar pulley below the hopper, the material being dropped onto an inclined belt elevator which discharges it into the top of the furnace. Both belts are provided with transverse slats of wood to give them a good hold upon the material. Ranged on each side of the belt are a number of trained "pickers," whose duty it is to turn over the heap of rubbish and take out the valuable material. Each man has to watch for a particular class of matter, and as he picks it out he throws it into empty barrels which are placed conveniently around him. There is a great difference in the value of the various kinds of refuse, and an endeavor is made to save the most valuable first. Consequently the pickers who stand nearest the dump carts are occupied in collecting the various kinds of paper in their order of value. Five grades of paper are recognized: Ledger paper, manila, folded newspapers, commons and strawboard. The next set of men pick out the different grades of "rags," in which are included clean whites, soiled whites, woolens, blacks, mixed and twine. Carpets are taken out according as they are woolens, hard back or soft back. Next the slowly moving and now considerably reduced strip of rubbish is relieved of its "bagging," and after this the "bottles" are taken out and dropped into their proper receptacles. Tin cans come next, and then shoes and rubber are taken out. By this time the rubbish is getting near the inclined belt which leads up to the furnace, and the last few pickers take out the metals, including copper, zinc, brass and iron, and any miscellaneous matter that may have a market value or be incombustible in the furnace.

The residue now falls over the end of the belt onto the elevator and is carried up to the mouth of the furnace. If the aforesaid citizen who designated the contents of the paper and rubbish carts as worthless could watch the scanty remnants that find their way up to the furnace, as shown in the illustration, he would receive a lesson in economy whose impression would last him a lifetime.

The assorted material in the baskets is taken to presses which are arranged in a row parallel to the table, where it is made up into bales, labeled and stacked on one side of the room ready for shipment to the dealers. The bales are piled in separate lots according as they are made up of "ledger" paper, "manila," "white rags," "hard" or "soft" back carpets, etc. The prices paid for this material vary greatly. Print papers bring $5 per ton; folded newspapers, $8 to $9 per ton; manila, from $10 to $17; and letters and ledgers from $27.50 to $37.50 per ton. It may interest our readers to know that in New York City alone the trade in waste paper and rags suitable for paper manufacture is estimated to reach an annual value of $1,755,000.

The bottles collected from the table are assorted according to their various kinds, and sold to the junk dealers, three classes being recognized: 1. Beer and soda water bottles. 2. Milk bottles. 3. Miscellaneous. Those which have the proprietors' names blown in them are sold to a dealer who sells them to the Bottlers' and Manufacturers' Association of New York, which in turn distributes them to the owners. The magnitude of this trade alone may be judged from an estimate by one of the leading dealers, who puts down the collections from the city dumps at about 500 barrels a week. This would represent a yearly value, at the market price, of about $40,000.

The old shoes are sorted according to their quality. Those which can be made to pair and are in fair condition are sold to tenement district shoemakers and cobblers at 15 cents a pair and the rest at 5 cents a pair. The balance of the salable material is bought by the various junk dealers, and what cannot be sold or burnt (a remarkably small percentage, by the way) is carried to the dumps.



A GROUP OF EXPERT RAGPICKERS.

The steam generating furnace is a rectangular brick structure 12 feet wide, 9 feet deep and 16 feet high, with walls and roof of a uniform thickness of 2 feet. It is lined throughout on the inside with 9 inches of firebrick, and immediately back of the firebrick is a series of flues or air spaces from which hot air is drawn into the furnace above the grates, to assist in producing a perfect combustion. There are three watertube grates, one above the other, which slope in alternate directions. When the material falls into the furnace through the shoot situated near the roof, it drops onto a grate which slopes forward and reaches half way across the furnace. From this it drops

onto a second grate, which slopes in the reverse direction from the opposite wall, and also extends half way across the furnace; from this it falls onto the last grate, which reaches entirely from wall to wall. Above each grate a large number of tuyeres admit hot air to the incandescent mass of rubbish (which, from its nature, tends to become matted on the grates) and help to keep it in active combustion. Each grate consists of a set of water tubes which terminate at the lower end in a water pipe and at the upper end in a steam pipe. The several water pipes are connected together and are fed at the bottom by a small donkey pump.

The steam and gases are led to a horizontal tubular boiler which is mounted a few feet distant from the furnace. The steam which collects in the steam pipes is carried into the steam drum. The gases are conducted by a flue into the lower part of the combustion chamber. They are then drawn through the tubes and pass through a suction fan and a cyclone dust separator, finally escaping to the stack.

It was necessary in designing the furnace to provide that the gases should pass out of the smoke stack free from smoke and dust, and it was this consideration that governed the arrangement of this part of the plant. It was decided to use both the "induced" and the "down draught" system in the furnace, and, consequently, a fan, driven by a direct-connected engine, was placed midway, as shown, between the auxiliary boiler and the smoke stack. The air is drawn in at the top of the furnace and passes down through the three grates. The heat of the gases was too great to admit of using a fan at the exit from the bottom grate; but by using the second boiler the temperature was lowered to 750 degrees, and another 100 boiler horse power was realized. The furnace consumes from 1 pound to 1½ pounds of rubbish per square foot of grate surface per minute. The boilers furnish sufficient steam to run the 20 horse power fan engine, the 5 horse power engine for running the sorting table and the feed pump, and steam at 70 pounds pressure is continually being blown away through a 3½ inch steam pipe.

The cyclone dust separator consists of an inner and outer cone and a set of four spiral vanes which divide the space between the cones into four spiral passageways. As the furnace gases are blown through these they acquire a whirling motion, and the centrifugal effect drives the heavy particles of dust to the outer wall, where they pass through a narrow slot into the dust box, which, by reference to the engraving, will be noticed just below the separator. That this apparatus is remarkably efficient is proved by watching the top of the smoke stack, which is free from smoke and dust and gives no indication that the furnace is at work.

The refuse which is brought to this plant, which is located near the foot of East Eighteenth Street, is gathered in the surrounding district. It would not pay to cart it from distant parts of the city. If the plan proves financially and otherwise successful, it is intended to establish similar plants at various points to be subsequently determined upon. Our thanks are due to Commissioner Waring, of the New York Street Cleaning Department, and to Mr. L. Colwell, the designer of the furnace and boilers, for courtesies extended during the preparation of the foregoing article.


"PAPER AND REFUSE" CARTS AND BALING PRESSES.

### Carbide of Silicon in the Manufacture of Steel.

The American Engineer and Car Builder, referring to the patent issued recently to Alfred E. Hunt, Benjamin Talbot, and Percival Roberts, on the use of carbide of silicon in the manufacture of steel, adds: Carbide of silicon is made by passing an electric current through a cove of sand mixed with coke. The finer and better grade is used as an abrasive, but there is produced considerable material which is not valuable for that purpose and can be sold cheaply. It has been used experimentally at Pencoyd. It is split up and gives both silicon and carbon to the molten steel. It quiets and solidifies the metal and may become useful in the manufacture of castings and other specialties when solid metal is desired. It has the advantage over ferro-silicon, with 10 to 12 per cent of silicon, because the silicon in the carbide is concentrated, the carbide containing about 70 per cent of silicon and 30 per cent of carbon.


PROF. DE MAIN WOOD AND HIS ORCHESTRAL GUITAR.

### THE ORCHESTRAL GUITAR.

It is not often that the gift for music and the gift for practical mechanics exist in the same individual; but it must be admitted that the really wonderful instrument which we show in the accompanying illustrations proves that this rule, like many others, has its exceptions. Generally speaking, the attachments which are occasionally fitted to guitars, harps, and other stringed instruments are not a musical success—whatever may be their mechanical merit; but after listening to the vox humana and mandolin effects, as rendered by Prof. Wood, of Muncie, Indiana, in this office, we are free to confess that he has achieved a brilliant success in the problem which he set out to accomplish some 15 years ago.

In naming it the orchestralguitar the inventor has aptly described the difference between his instrument and the ordinary guitar. The various attachments which have so completely changed the appearance of the instrument enable the player to combine the tones of the guitar, the mandolin, and the zither and to rival the finest vox humana effects of the organ or the violin.

There are in all four special attachments, as follows: 1. A subfinger board with four additional bass strings. 2. A mouthpiece for fingering the first string of the guitar. 3. A mandolin attachment. 4. A voice attachment.

On the neck of the guitar is fastened an extra piece of rosewood, the back of which is fitted in the same way as the ordinary finger board. The extra strings are strung along the under side of this board and they are fingered by the thumb of the left hand. It is thus possible to produce a chromatic scale of the bass notes without a multiplication of strings, as in the regulation subbass guitar. The boxlike structure, E, attached to the base of the guitar is the mandolin attachment. Of all the novel parts, this is the only one that is purely mechanical, the movement of the pickers being controlled by clockwork. The powerful driving springs are placed within the body of the instrument and firmly secured to the floor as shown in Fig. 3.

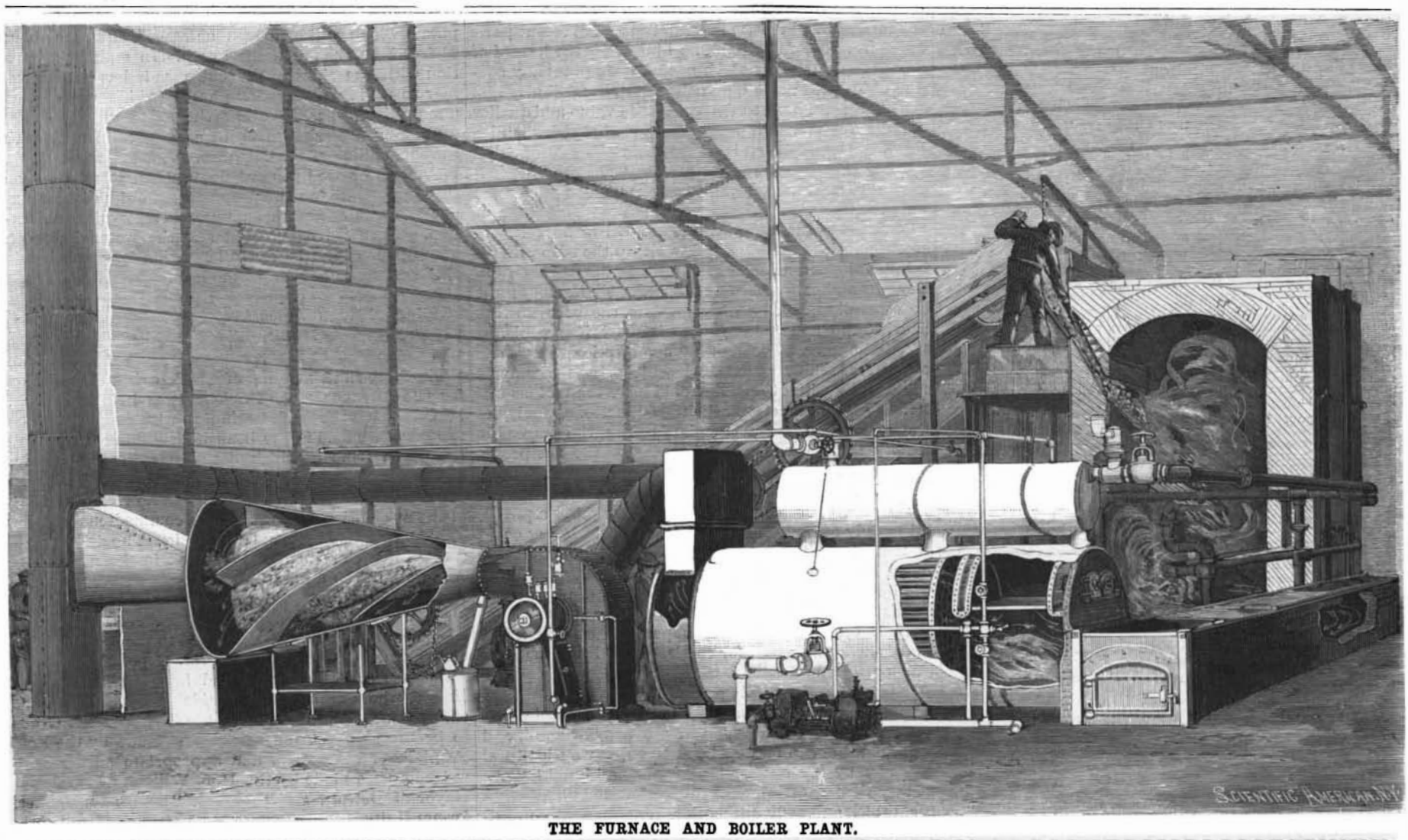
The controlling mechanism is contained within the box, F, from which a small shaft extends forward over the sounding board and carries at its outer end a little wheel armed with a series of steel wire pickers, C. The wheel with its pickers is housed in the half round cover shown in the engraving. Above the cover is a little lever, B, by which the clockwork is started or stopped. When the mechanism is started the wheel and pickers, which are located just above the first guitar string, begin to rotate at a regular speed. Normally they are kept clear of the string by a spring; but when the player wishes to produce the mandolin effect, he presses the little button, C, and brings the pickers down upon the string, keeping it there as long as he wishes to use the tremolo effect. The attachment, A, is merely a handrest which is used in manipulating the above described parts. To give the pickers the desired resiliency they each contain a spring coil between the striking point and the point of attachment to the wheel. It will be seen that as the speed of the wheel is uniform, the number of strokes may be determined to a nicety by depressing the button, C, for a longer or shorter time, one stroke only being made, if desired. The result of this mechanism is an

# SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyright, 1897, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION ART, SCIENCE, MECHANICS CHEMISTRY, AND MANUFACTURES.

Vol. LXXVII.—No. 9. ESTABLISHED 1845. | NEW YORK, AUGUST 28, 1897. | $3.00 A YEAR. WEEKLY.

THE FURNACE AND BOILER PLANT.

SORTING TABLE AND FURNACE AT THE "PAPER AND REFUSE" PLANT.

**THE DISPOSAL OF THE WASTES OF NEW YORK CITY.**—[See page 136.]