

## HENRY SAXON SNELL PRIZE.

**T**HE subject given in 1918 for the Essay in the competition for this Prize was "Suggestions for Improvements in Apparatus and Appliances for Dealing with House Refuse."

The Essay to include a description of practical methods for :—

- (a) Reduction in the quantity of refuse in the house.
- (b) Destruction of refuse in the house.
- (c) Utilization on the premises or sorting for utilization away from the premises.
- (d) Temporary retention on the premises.
- (e) Methods of collection from the premises, including the construction of collecting vans.

Thirteen Essays were sent in, and they have been brought under the consideration of the Council.

The Adjudicators for the competition were :—

Sir Henry Tanner, C.B., I.S.O., F.R.I.B.A., Chairman of Council.  
J. Patten Barber, M.Inst.C.E.

H. Percy Boulnois, M.Inst.C.E., nominated by The Institution of Municipal and County Engineers.

A. G. Drury, M.Inst.C.E., nominated by the Local Government Board.

Louis C. Parkes, M.D., D.P.H., M.R.C.S.

Acting upon the advice of the Adjudicators, the Council have awarded the Prize of Fifty Guineas and the Bronze Medal of the Institute to the author of the Essay, writing under the motto "*Ædile*," James Jackson, Superintendent, Salvage Department, Birmingham.

### Suggestions for Improvements in Apparatus and Appliances for dealing with House Refuse.

#### ESSAY, *ÆDILE*.

**T**HE title of this essay clearly shows the trend of thought in the minds of the Council of The Royal Sanitary Institute, that on this occasion the most important subject, and one ripe for development, is the necessity for improved apparatus and appliances for dealing with house refuse.

The author, in dealing with this subject, has also referred to the necessity for better methods and organisation, as he considers them to be

as important as, and inseparable from, the improvements necessary in apparatus and appliances.

That there should still be in existence in many large cities and towns the old privy midden, a veritable heritage of an insanitary past, or the slightly improved pail or pan system for the temporary retention of “refuse” on the householders’ premises, cannot but be regarded by the public in general, and sanitarians in particular, as a dark page in any description of the sanitary methods in operation in this year of grace 1918.

All sanitarians, and the term includes housing reformers, agree that for new property the fresh water-closet system is the only tolerable method for dealing with human excrement, and the portable galvanised bin the best sanitary appliance for the temporary storage of refuse awaiting the call of the dustman; and it is therefore incumbent on the Local Government Board, or the proposed Ministry of Health, immediately the War is concluded, to compel local authorities to substitute this combination for all other apparatus which may be in use.

Such an order, coupled with the housing schemes which it is admitted on all hands must be carried out without any vexatious delay, would give the biggest impetus to sanitation ever made in the United Kingdom. The immediate results in the saving of the lives of children, and the improvement of the general health of dwellers of closely populated areas, would be so marked as to stimulate the further application of organised direction, and thus prepare the way for other urgently needed reforms.

It has, unfortunately, to be admitted that however progressive a local authority may be, its endeavours can be, and are, largely nullified by the indifference and thoughtlessness of the very persons whom such measures are more particularly intended to benefit. The habits of a people are not easily changed; but it has been said that “the greatest asset of this country is the common sense of the common people,” and a strong appeal to that common sense in the cause of waste prevention would, we might well hope, not be made in vain.

The War has created a willingness to co-operate and be mutually helpful to each other, and this spirit of interdependence, which follows the realisation that the welfare of each is dependent upon and inseparable from the welfare of all, must be fostered and cultivated even more when peace is restored if this country is never again to return to the prodigally wasteful methods of pre-war years.

Local authorities must be *made*, if necessary, to carry out their functions, and must be given drastic powers to enforce their decisions. .

The first essential is the formation of a Ministry of Health. Unless there be established a strong controlling Government Department capable of carrying on research work, and co-ordinating the work of cleansing as well as other sanitary measures, it is useless to expect a thorough overhaul of the insanitary and wasteful methods so prevalent in the country. In the words of our Prime Minister, "We have been employing too many of the haphazard, leisurely, go-as-you-please methods," and we have neglected the wonderful advantages of "scientific management."

Government and municipal waste is already receiving a large amount of official and public attention, and we may reasonably hope that valuable and much-needed economies and improvements will materialise. The public cleansing service in particular offers scope for that organisation and specialisation which is so noticeable a feature of great industrial businesses.

In order to approach the subject intelligently, it is necessary to consider for a moment the composition of house refuse. The following analysis recently issued by the National Salvage Council bears out results obtained by the author from tests made by him in several large centres of population:—

#### ANALYSIS OF 10 TONS 2 CWTs. OF HOUSE REFUSE.

	Per cent.	Weight.				Estimated total quantity per year in England.	
		Tons.	Cwts.	Qrs.	Lbs.	Tons.	
Fine dust .....	87.74%	56.80	5	14	3	0	5,367,600
$\frac{1}{2}$ in. cinders .....		30.94	1	9	2	0	2,923,820
$\frac{1}{4}$ in. cinders .....			0	16	3	0	
Large cinders .....			0	16	1	0	
Bricks, pots, shale, etc. ....	12.26%	8.57	0	17	1	7	809,865
Tins .....		1.03	0	2	0	10	97,335
Rags .....		0.40	0	0	3	5	37,800
Glass .....		0.61	0	1	0	26	57,645
Bones .....		0.09	0	0	0	20	8,505
Vegetables .....		1.30	0	2	2	12	122,850
Scrap Iron .....		0.12	0	0	1	0	11,340
Shells .....		0.08	0	0	0	18	7,560
Paper .....		0.06	0	0	0	14	5,670*
TOTAL .....	100.00	10	2	0	0	9,450,000	

\* The National Salvage Council estimates that 58,000 tons of waste paper is recoverable from refuse annually, equal to about 0.6 per cent.

This analysis reveals a potential sphere of operations for all public authorities which has hitherto been sadly neglected. The obvious moral, namely, that nearly one-half of this "refuse" has a distinct value, must be brought home to the cleansing official, the householder, and in particular to the housewife, so that, as far as possible, waste may be checked at its source.

How can this be accomplished? It can only be done by a practical demonstration which shall at all times be available, and under observation by the persons concerned. This demonstration may be obtained by the adoption of what may be styled the “Dual Bin System” in connection with dwelling houses, *i.e.*, one bin for riddled ashes and sweepings, and another for all other approved household waste or “salvage.”

It is admitted by all persons who have given close study to the problem of salvage from household waste that the best results can only be obtained by keeping the ashes and sweepings separate from other refuse.

In the opinion of the author all refuse should be removed daily, but where this cannot be done, not less frequently than twice weekly. The advantages resulting from a daily collection of refuse would be:—

- (a) No refuse need remain on the householders’ premises until it became objectionable and dangerous to health.
- (b) The contents of the salvage bin would be obtained in a fresh condition, and consequently could be better utilised on arrival at the dépôt, and the work of grading would not be offensive.

The author would simplify the present vexatious methods connected with the provision of bins, entailing the serving of notices on owners to provide bins, and would either make it entirely a charge on the local rates, or have the bins installed in the first instance by the local authority, and then make a renewal charge of, say, one shilling per annum, to be paid by the owner of the property for each bin in use; this charge to be included on the demand note for local rates. The local authority could then renew bins as required, and avoid the roundabout way of serving notices.

The bins for a twice-weekly collection should be 15 ins. diameter by 17 ins. high, which is sufficient for all *reasonable* requirements for ashes and sweepings, yet small enough to be carried when full by one man.

The “salvage bin” should be of the same size as the “ashes bin,” and boldly lettered “This Bin and Contents are the Property of the ‘Well-being’ Corporation,” and all “tatting” by the men employed by the local authority should be prohibited. The “ashes bin” should be lettered “Ashes and sweepings only.”

By the adoption of a bin of standardised construction for the whole country the cost of the manufacture of new bins would be considerably reduced.

Local authorities should be given power to require that all bins be placed under cover and in a position convenient for removal. A drawing (*not reproduced*) shows a covered-in place which is extensively used in one of our largest cities. The refuse is thus to a large extent prevented from being deposited in various parts of yards, and any overflow can more easily be

dealt with. It is the experience of all officers engaged in the removal of refuse that the lids are generally discarded, and a covered-in place is therefore necessary to prevent rain-water from getting into the bins, a source of needless expense if the contents are to be used for steam-raising or salvage operations.

It is the custom for gas and electricity undertakings to publish instructions relating to the uses of their commodities. Why not apply the idea to "Refuse"? If a neatly printed card were hung in every kitchen it would be a constant reminder as to how the householder could co-operate with the local authority.

The author submits the following as a specimen :—

### BOROUGH OF WELL-BEING.

#### SALVAGE DEPARTMENT.

Housewives are asked for their hearty and sympathetic co-operation in preventing waste matter from unnecessarily finding its way into the bins, when it at once becomes a charge on the rates.

#### WHAT YOU CAN DO.

REDUCE the quantity of refuse to be removed.

DON'T put water or any liquid into either bin—it is not fair to the dustman.

DON'T put *unriddled* ashes into Ashes Bin—reduce your coal bill and your rates.

DON'T put garden refuse into either bin. Bury it in your garden, or, better still, burn it; the ashes are a valuable manure. In either case your garden will benefit.

DON'T put vegetable refuse into either bin. It is a valuable food for pigs and poultry. If not used thus, it should be buried in your garden or burnt on the kitchen fire.

The ASHES BIN is for riddled Ashes and Sweepings only.

The SALVAGE BIN is for: WASTE PAPER,  
RAGS,  
TINS AND CANS.

The CORPORATION have power to enforce the observance of these instructions.

#### HOUSEWIVES!

Here is a unique opportunity to help yourselves, your town, and your country, by your co-operation in seeing that these simple rules are observed.

WON'T YOU ASSIST?

JOHN BULL,  
*General Manager.*

Salvage Department,  
Town Hall.  
September, 1918.

This publicity work should be extended through our schools, and both boys and girls regularly taught and encouraged to assist in the crusade against waste of all kinds; indeed, the subject might well be included in a course of lessons on “Citizenship.”

#### ORGANISING REFUSE COLLECTION.

In most towns it is the custom to commence work at from 6 to 6.30 a.m., the men being allowed half an hour for breakfast and one hour for dinner, finishing work at from 5 to 6 p.m.

In the opinion of the author, it is necessary that local authorities should realise that the trend of the future is towards shorter hours. Nearly all the great commercial undertakings in this country and America have been forced to the conclusion that too long a working day is neither good for the worker nor the undertaking.

The men should leave the depôts at 7.30 a.m., having previously taken breakfast either at their own homes or at the dépôt canteen. They would then proceed to the commencing point of the day's work, arriving at about 8 o'clock, and should not be kept waiting for shop and yard doors to be opened, as is the case when commencing at the earlier hour. This alteration has been introduced in parts of the author's own district, and the reduction in delays suffered by the workmen has more than compensated the later starting time.

It is found in actual practice that the quantity of refuse produced in any given area varies up to 40 per cent. in total output, according to climatic conditions, and it is not economical therefore for any collecting vehicle to cover precisely the same area and mileage all the year round.

The ideal system is to map out the collection area into districts, the boundaries of which must be governed by the position of the places of disposal, viz., depôts, destructors, tips, etc. These districts should then be sub-divided into rounds, the necessary data for each being (a) number of standard bins; (b) number of houses; (c) mileage collecting; (d) dead mileage travelling to and from dépôt. The work on each round should commence at a given point furthest from the dépôt, and the refuse should be collected street-to-street and house-to-house towards the disposal point, care being taken to reduce the “dead” mileage to a minimum.

Each district and round should have a “reserve area” approximately within half a mile around the place of disposal, to accommodate the “ebb and flow” of the work of collection resulting from the variation in the quantities of refuse occurring from time to time. During the winter months this reserve area would probably not be worked

by any of the usual vehicles, and would have to be cleared by relief vehicles. During the summer or "light" periods of the year the men on each round would work as far as possible into the reserve area, and in the event of any bins not being emptied these would still be attended to by relief vehicles.

By such methods the organisation can be made elastic; but another important factor must not be overlooked if full advantage is to be taken of this varying output of refuse, viz., the co-operation of the workers.

The author is convinced, from actual experience, that the best results can only be obtained by settling with the workmen what is a fair day's work, and agreeing to pay a bonus system for all additional work, giving the men a guarantee that not only shall their rate of pay not be interfered with, but that every encouragement shall be given to them to increase their earnings.

#### HOW THE REFUSE SHOULD BE REMOVED.

In some towns it is the practice for householders to place the bins on the street footway, awaiting the collecting vehicle. Where a daily collection is in operation, this is the common-sense method to adopt, but it is doubtful if even a Ministry of Health would have the courage to enforce it as a uniform practice, owing to the strong aversion which is entertained by the large bulk of the people against being incorporated as part-time workers on the scavenging staff. Local authorities will, therefore, probably continue to remove bins from the rear of dwellings, and to bear the additional cost involved.

The author had in mind this additional cost when recommending that local authorities should provide and renew bins. The removal vehicle having arrived to remove the refuse, the labourer would take with him to the rear of the house, an empty "salvage bin." He would then return to his vehicle with the full "ashes bin," which, after being emptied of its contents, would be taken back to its usual position. He would then return to his vehicle with the full "salvage bin," which, after emptying, he would take to the next premises, and so on.

This procedure, which reduces the distance to be travelled by the workmen to a minimum, renders it necessary for the "salvage bin" at least to be owned by the local authority. It could not otherwise be transferred to other dwellings, and three journeys to the premises would be necessary on each visit, instead of two by the method described above. The cost of providing either the "salvage" or even both bins would be quickly recouped by the economy of time and labour resulting.

It has been fully demonstrated during recent years that the most

economical method of removing refuse is by electric vehicles, and wherever such a method of transit can be adopted there should be no hesitation to gradually discard horse haulage. It is found in actual practice that approximately six hours per day are spent in loading the vehicle, and two hours in conveying the refuse to its destination. By the adoption of the electric vehicle, not only can vehicles of larger capacity therefore be used, but the removal is much quicker.

Towns of reasonable size could provide the bulk of their own electrical energy from destructors, whilst it is certain that the future has in store a radical upheaval of our present localised methods of generating and distributing current, and in a few years it will be an easy matter for any district to obtain the necessary supply.

According to the analysis of house refuse already quoted, the contents of the “salvage bin” would comprise about one-eighth (in weight) of the total refuse. The removal wagon should therefore be divided into two compartments, one for the ashes and sweepings, and the other for the contents of the salvage bin. Drawings (not reproduced) show an electric vehicle admirably suited for the purpose, the chassis being so arranged that the bins have only to be lifted 5 ft. 1 in. for emptying into the wagon.

Two cover arrangements are shown, both of which are in actual operation. They are easily opened and closed on each occasion of use, and for the purpose of inspection if the weight of contents is not satisfactory on passing over the weighing machine at the dépôt. The author has found it quite useless to have covers which have to be rolled up by hand, or worked on any sliding arrangement. Such methods involve too much labour, and, however good they may be theoretically, are not satisfactory in actual practice.

#### TREATMENT AND DISPOSAL OF REFUSE.

The exigencies of the War soon constrained us to become economical in the use of means and of materials, and it would be comparatively easy to give innumerable instances of prodigal waste in almost every trade and calling. The great shortage of raw materials not only rendered it imperative that waste in all directions should be avoided, but also made us consider whether what had hitherto been regarded as waste could not be utilised for the common good.

A great impetus was given to municipal salvage work by the appointment of the Royal Commission on Paper, and later by the formation of the National Salvage Council. In the opinion of the author, both these bodies would have been more successful had they not had to depend so



much on moral suasion, but had power given to them to compel local authorities and the general public to do their duty.

Up to the time of writing this paper many local authorities have disregarded the injunctions of both the above bodies, and will, unless compelled, continue to do so.

The principal methods of disposing of refuse in force at the present time are:—(a) Tipping on open ground; (b) Burning in destructors; (c) Barging out to sea.

It is, however, becoming recognised that the indiscriminate use of any of these outlets is fundamentally wrong, and that the refuse should first be subjected to some sorting process by which material of value may be saved. In the author's opinion no screening or other process for recovering this valuable material will be satisfactory unless the local authority and the householder work together for the common good, and this view is supported in the adoption, by one of the largest authorities in this country, of the dual bin system. If salvage work is to be carried on economically and under sanitary conditions, (and in our zeal for recovery the latter condition must not be overlooked,) the refuse must not be mixed at its source.

The observance of this vital condition would have a far-reaching effect in reducing the cost, and on the type of plant necessary for treating refuse, the task of local authorities would be minimised, and the use of human energy would be considerably reduced in favour of mechanical appliances.

The reader will recollect that according to the table given on page 114 approximately 50 per cent. of household refuse consists of fine ashes or dust. An average sample of this fine dust passing through a half-inch screen gives the following analysis:—

	Moisture	...	...	...	2·84%
(a)	Mineral Matter (Ash)	...	...	...	68·56%
(b)	Organic Matter	...	...	...	28·60%
					<hr/>
					100·00%
<hr/>					
(a)	The Ash contained:—				
	Siliceous Matter	...	...	...	38·50%
	Iron Oxide and Alumina	...	...	...	24·80%
	Lime	...	...	...	4·93%
	Magnesia	...	...	...	trace
	Phosphoric Acid	...	...	...	0·77%
(b)	Organic Matter contained:—				
	Nitrogen	...	...	...	0·70%
	Ammonia	...	...	...	0·86%

It is apparent that this dust by itself would not serve as a manure, but its value can be materially increased by the addition of street sweepings and water. This latter practice has been in operation for a number of years by the Cleansing Department of Glasgow, and is found to produce an excellent fertiliser finding a ready market.

If it be found more economical to deposit this dust on tips, the advantages of screening are also most striking.

The objections to depositing dry, unsorted, and unscreened refuse on tips are:—

1. The tips are made unsightly on account of the waste paper, tin cans, etc., in the refuse.
2. They become breeding grounds for rats and flies.
3. They are almost certain to fire, and it is extremely difficult to extinguish such tip fires after they have burnt a little time, in consequence of the presence of free air in the tips caused by buckets and cans, and the high calorific value of much of the refuse, such as cinders, oily rags, and paper.

By separating the fine ashes and sweepings from other refuse, the objections to tipping as carried on to-day would be removed.

Whilst the author has no interest whatever in any firm, he has obtained the permission of The Grange Iron Co., Ltd., of Durham, to reproduce a few of their drawings which have been prepared for his own Corporation, intended for use in conjunction with the dual bin system. These drawings can, of course, be modified to suit local conditions.

Drawing No. 1 (page 125) shows hopper, vibratory screen, and shoot, intended for two purposes, namely:—(a) Separating fine dust from the contents of “ashes bin,” and which as illustrated can be taken away by boat, wagon or truck; (b) Delivering cinders near the destructor cells for charging.

This plant alone will effect a 100 per cent. increase in the capacity of the depôt and destructor, and materially increase the efficiency of the steam-raising plant.

Having dealt with the fine dust of the “ashes bin,” there then remains the coarser material consisting almost entirely of cinders, and varying in quantity according to the thriftiness of the housewife.

If it is not desired to use the cinders for steam raising they can be screened and washed, as shown in drawings Nos. 2 and 4 (pages 126 and 129). It has been demonstrated that cinders have a calorific value of from 9,300 to 10,000 B.Th.U.’s per lb. A good house coal should give about 14,000 B.Th.U.’s. So on a heat value basis cinders at 20s. a ton would equal in value coal at 30s. per ton. The author admits that such cinders or breeze will not

burn freely in an ordinary grate, and that it is not a clean fuel for household purposes owing to the large amount of resultant ash; but if it be mixed with an equal quantity of coal it burns well, and should find a ready market. As a fuel for greenhouses it is also quite good, giving the steady continuous heat so necessary for such places.

As already stated, approximately one-eighth of household refuse may be regarded as material to be deposited by the housewife into the "salvage bin," and this material, on arrival at the *dépôt*, should be passed direct on to a long travelling belt, from which the various classes of material would be sorted and graded. (See drawing No. 3, page 127.)

If new and better methods are to be adopted, it is necessary that various schemes should be well considered and compared, as no one scheme will suit the requirements of all localities. Whilst it is certain that salvage has come to stay, the present inflated prices of reclaimed materials will not be maintained after the War. Local authorities will, therefore, do wisely to call in experts to advise them on the subject, so that costly blunders may be avoided.

The author would repeat that ideal results can only be obtained with the willing co-operation of the householder in making a success of the dual-bin system. For any authority to attempt to screen and sift all kinds of mixed house refuse is to court disaster, for no real success can be obtained by such a course.

The number of sorting belts required if the dual bin system be in operation, is reduced to a minimum, the handling and disposal of the material is made easier, and the cost considerably reduced.

In small districts it is not a commercial proposition to put down plants for dealing with many of the by-products referred to below. The Ministry of Health should therefore co-ordinate authorities within prescribed areas, so that not only may the material be reclaimed, but that unnecessary duplication of expensive plants may be avoided. Such schemes are already in operation at Bradford and Birmingham, these two cities having agreed to assist smaller authorities, some of which are over forty miles distant.

#### FUTURE DEVELOPMENTS.

From time to time one hears sweeping statements to the effect that destructors are a thing of the past. In the opinion of the author, such statements betray a misconception of the requirements of the future. Just as tips will certainly be required, so will destructors; there is no single panacea. Everything will depend upon the conditions governing each case, and no particular scheme will meet all conditions.

Authorities may find it cheaper to continue to burn coarse screened refuse where steam is required for:—(a) Treating condemned fish and fish waste; (b) Treating condemned meat and bones; recovery of fat and manufacture of glue size; (c) Treating slaughter house and vegetable refuse, or generating electric current for running the following plants:—(d) screening refuse; (e) sorting refuse; (f) paper bundling; (g) detinning and tin plate cutting; (h) scrap metal bundling; (j) charging electric vehicles; (k) detinning plants; (l) mortar mills; (m) screening clinker for tar macadam roads and concrete; (n) workshops; (o) lighting; (p) running of fans; (q) shellac making from old hats; (r) treatment of worn out boots, etc., etc.

This list includes certain items (a, b, and c) which do not strictly fall within the term, “house refuse,” but which, in many large towns, are dealt with by the Cleansing or Salvage Department. It only gives the principal uses for which steam and power are required, but it is sufficient to emphasise the fact that large centres of population *must* continue to own and work destructors.

It is certainly true, however, that never again will all refuse be indiscriminately passed through the destructor cells, and their number will therefore be considerably reduced. In large centres of population, one destructor could work most of the above plants, leaving for the other destructors only screening of house refuse and clinker, mortar making, charging of electric vehicles and lighting. By this arrangement the size and cost of plants could be minimised, with a consequential reduction of capital and working charges.

Seeing that a great part of the refuse will in future be salvaged or reclaimed, the author submits that the time is opportune for renaming destructors, and that by the adoption of some such title as “Salvage Works” or “Waste Reclamation Works,” the public, and particularly the coming generation, may be further educated to the principle that “there is no such thing as waste.”

There is no recognised system of comparisons between local authorities as to the quantity of refuse handled and the cost of dealing with it. Indeed, the method of computing the quantity varies; in some cases it is reckoned by the load, in others by weight, whilst one of our greatest municipalities reckon it by the cubic yard.

If a water carriage and standardised portable bin system were in operation, together with a system of weighing, one standard could be adopted and reliable comparisons made.

It will be the duty of the Ministry of Health or other controlling body

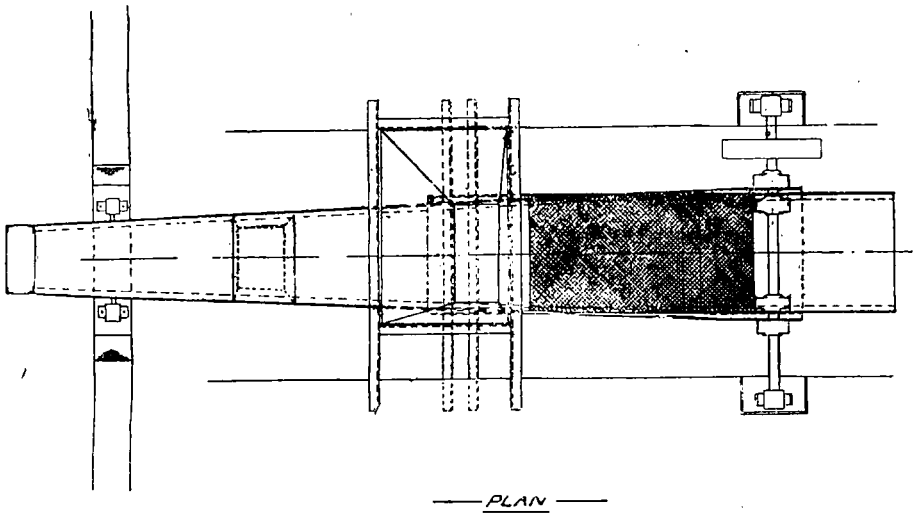
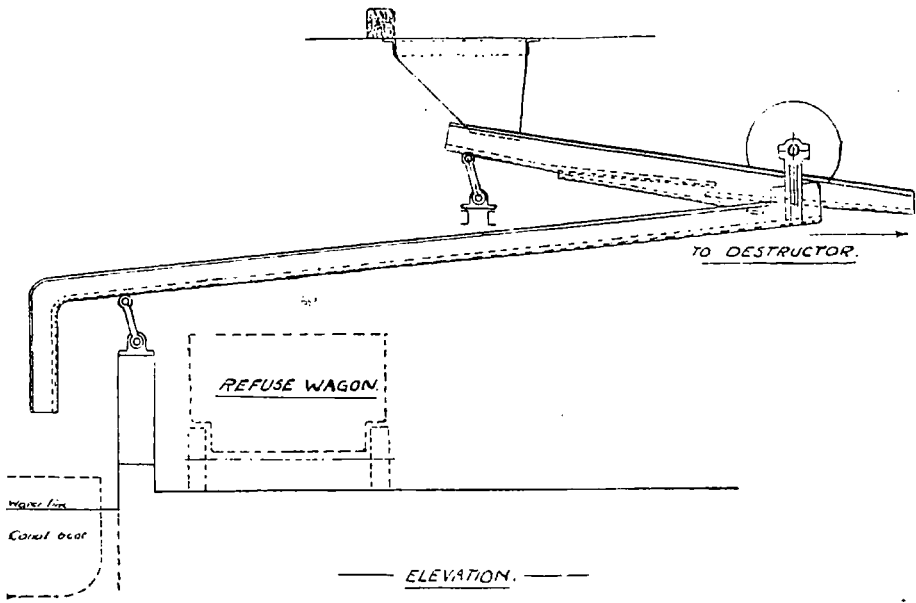
to see that co-ordinated efforts are made throughout the country so that those schemes which research and experience prove to be the best may, nay, shall, be put into operation. The temptation to let the big progressive municipalities do the pioneer work is understandable, but it would be better to rely on a strong Government Department organised for the purpose. The Prime Minister (Mr. Lloyd George) speaking at Manchester, September 12th, said :—"The State must take a more constant and more intelligent interest in the health of the people. . . . We must have a more intelligent organisation of the forces in charge of the health of the nation."

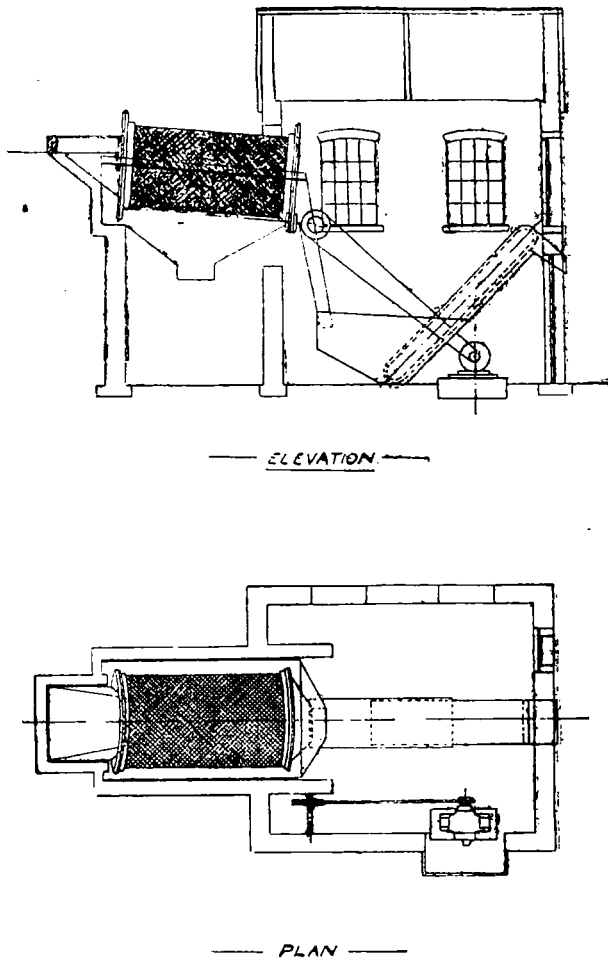
Efficiency must be our watchword. Research, statistics, and costing will show us our deficiencies, and point to improved methods and organisation ; strong sustained effort will do the rest.

---

1. Plant for separating Dust from Cinders (page 125).

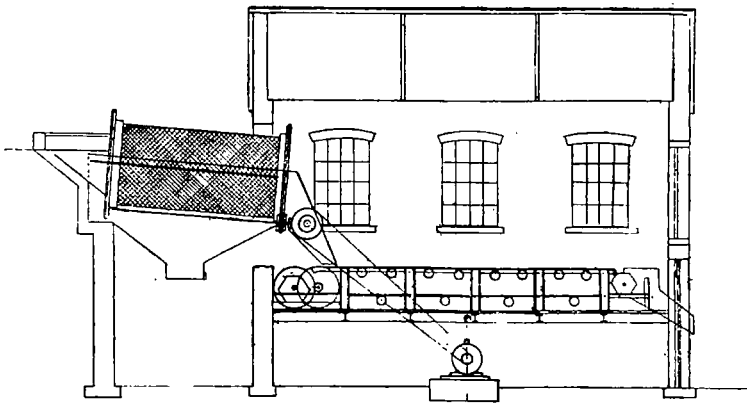
The carts will discharge their load into receiving hopper, from which it will fall by gravitation into a vibratory screen. The first portion of this screen will have a perforated bottom, through which will fall the fine ash on to a dead plate, which is about six inches lower. The cinders go forward on to a dead plate, and are discharged on to the cell ready for charging. The fine ash is discharged off the bottom of the dead plate on to the top of a vibratory shute, which in turn conveys the ashes into canal boat. A door is placed in a convenient position in the bottom of the shute. When necessary this door can be raised, thereby allowing ashes to fall into cart, motor wagon or truck



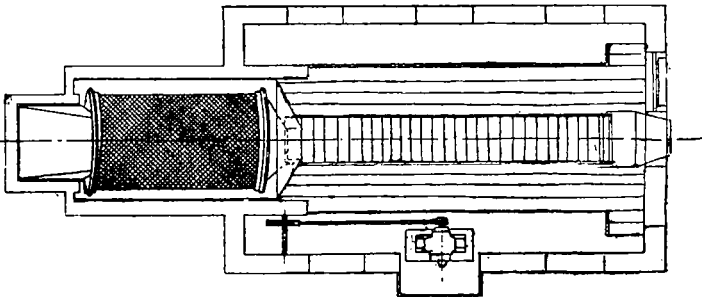


**2. Plant for separating fine dust from cinders, showing cinder-washing arrangement.**

The refuse will be tipped over tipping beam into hopper, which discharges by gravitation into revolving screen. This screen will be perforated to take out fine ash which will fall into the hopper directly underneath, from whence it can be taken away in carts, or, if necessary, a conveyer can be placed at this point to carry the material into boats or any desired position. The cinders fall into a hopper at the lower end of screen, which conveys them to the washer.



ELEVATION.



PLAN.

### 3. Plant for sorting contents of Salvage Bin.

The refuse will be tipped over tipping beam into hopper, which discharges by gravitation into revolving screen. This screen will be perforated to take out the fine ash, which will fall into the hopper directly underneath, from whence it can be taken away by carts, or, if necessary, a conveyer can be placed at this point to carry the material into boats, or any desired position. The salvage material falls down hopper on to a picking belt, alongside which women would sort and grade the various materials of value, and would be the only place where the handling of refuse would occur.



#### 4. Cinder Washing Plant.

The refuse is fed into a hopper, and falls by gravitation into a tank which forms the washer, and is filled up to a certain point with water. On this tank is placed a grid or washing table, directly under this washing table is placed a paddle; in this paddle are sundry valves, and a reciprocating motion is given to this paddle by means of an eccentric, which causes an agitation in the water. This agitation keeps the coal and other matter in a certain amount of suspension in the water, in such a way as to allow the debris or heavier materials to form a bottom layer or strata, the cinders remaining on the top. Due to the agitation in the water, the whole mass gradually works down the inclined washing table, and the cinders flow with the water over a weir, while the debris settles on a door. When a certain amount of debris is on this door it overcomes the resistance of the balance weights, causes the door to open until a counterbalance is maintained, when the door closes. The debris, which has been discharged, falls through a shute into a debris conveyer, where it is elevated out of the water. The cinders, being washed over the weir, settle into the cinder elevator, which also conveys it out of the water.

The water is kept in circulation through an outlet pipe, which returns the water to the underside of the paddle, where the cycle of operations repeats itself.