

MILLIONS FROM WASTE

BY
FREDERICK A. TALBOT

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PREFACE

The reclamation and exploitation of waste products for a variety of industrial uses constitute one of the most fascinating and increasingly important developments in modern industry. It is a subject of which very little is known outside privileged circles, and the possibilities of which are but scantily appreciated by the average individual.

The purpose of this volume is to indicate certain of the most obvious channels through which wealth incalculable is being permitted to escape, as well as the narration of something concerning the highly ingenious efforts which are being made to prevent such wastage. While written essentially for the uninitiated reader, the hope is entertained that it may prove of certain service to those who are fully alive to the potentialities of refuse of every description, and who are endeavouring to redeem the country from the charge of being wantonly extravagant in its use and consumption of raw materials, both edible and industrial.

The subject of waste reclamation is too vast and intricate, albeit romantic and fascinating, to be treated within the scope of a single volume. Consequently I have confined myself rather to those phases which are familiar to the average person and to the losses which are incurred from their inadvertent destruction—losses which affect both the individual and the community in general. If it succeeds in acquainting the man-in-the-street and the woman at home with the enormous wastage, both of finance and kind, which are incurred in these most familiar fields during the course of the

year, and persuades them to observe methods of thrift, a material contribution to the national wealth should be effected.

In the preparation of this work I have been extended liberal and courteous assistance from numerous sources. I am especially indebted to the War Office, the National Salvage Council, the Food Production Department, and the Paper Controller, also to several civic and municipal authorities, notably of Glasgow, Edinburgh, Bradford, and San Francisco. I have also been fortunate in securing valuable co-operation from several gentlemen interested in the waste problem, including Messrs. J. H. Pooley and James Macgregor, of Messrs. Ernest Scott & Co., Limited, of London, Glasgow, Fall River, Mass., U.S.A., Montreal, and Buenos Aires; Mr. Jean Schmidt, of Industrial Waste Eliminators, Limited, London; Winget Limited, London; Mr. H. P. Hoyle, of the Grange Iron Company, Limited, Durham; Mr. F. N. Pickett, Hove; and J. Grossmann, Esq., M.A., Ph.D., F.I.C., etc., as well as the Editors of the *World's Work* and *Chambers's Journal*, to all of whom I express my best thanks.

FREDERICK A. TALBOT.

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Millions from Waste

CHAPTER I

WASTE: ITS RELATION TO COMMERCE AND NATIONAL ECONOMY

Extravagance is the inevitable corollary to cheap living. The expression “living” is used in its very broadest sense, and is by no means confined to the mere consumption of foodstuffs. If living be cheap the thousand and one attributes complementary thereto, from wearing apparel to creature comforts for the home and from raw materials to finished goods, must necessarily rule low in price. Under such conditions the very fact that it is cheaper, as well as easier and simpler, to incur a further capital charge, rather than to endeavour to induce additional service from what is already in hand, though possibly damaged slightly, prompts waste, in precisely the same way as it is more expedient to replace the damaged part of a standardized article, whether it be a motor-car, sewing machine, typewriter, or watch, than to attempt to carry out a repair.

The ready availability of a spare part directly encourages waste more or less. The convenience is provided at an attractive figure to appeal to the consumer, while to the producer it renders a higher proportion of profit than is attainable when it forms part and parcel of the complete finished article. The latter is not marketed at the aggregate of the prices of the integral parts, as one may promptly verify if they feel so disposed. From this it must not be imagined

that replacement *per se* is to be condemned, except that it is often attended by the complete loss of the displaced and damaged part. Were the conservation of the removed part conducted the system would be deserving of whole-hearted support, because in this way the material of which it is wrought would be available for further use. Those firms which insist upon the return of a damaged section before they undertake to forward the replacement are pursuing a wise policy. It is true they consign the faulty or worn part to the junk pile, but, at intervals, the latter is turned over to the manufacturing interests to undergo further exploitation.

It is also somewhat significant to record that improvidence is intimately associated with cheap labour. Cheap living and cheap labour go hand-in-hand. As a matter of fact, until recently the average working members of the community, from the comparative point of view, have been guilty of greater improvidence than those who are well-blessed with this world's goods.

This apparent anomaly is readily explicable. In the houses of the wealthy the accumulation of residues of every description must necessarily attain imposing dimensions. But these wastes are not lost to commerce and industry. In the majority of cases they are handed over to the employees by whom they are regarded as legitimate perquisites. To gratify some individual whim, passing fancy, or from inherent tendency to bargain, these residues are carefully garnered and harboured to be converted into cash through one or other of the many purchasing channels which appear to diverge to these centres. The cooks dispose of bones, fats, and greases, as well as other wastes from the kitchen, to the itinerant rag-and-bone merchant; rejected wearing apparel finds its way to the wardrobe dealer; worn-out copper, iron and aluminium

culinary utensils, as well as divers other metallic odds and ends gravitate to the specialists in old iron and waste metals; superfluous produce from the kitchen garden meets with profitable distribution, while even the swill is able to command its market.

It is the opportunity to profit in pocket from such “extras” which acts as the incentive to collect, separate and to bargain for the sale of wastes from a pretentious house. But, as the social scale is descended, the tendency to keep a tight hand upon the refuse suffers unconscious relaxation. This is primarily due to the fact that the volume of such accumulations undergoes attenuation as the social ladder is descended. As the bulk diminishes so does the impression, “Oh! it is not worth while troubling about!” become accentuated. Finally, when we reach the bottom of the ladder—the average working household—the quantity of waste is considered to be so trifling as to be deemed quite unworthy of consideration. Consequently, here we find the whole, or at least 90 per cent., of the refuse consigned to the fire, or to the rubbish heap, instead of being preserved and turned into a profitable channel to receive a new lease of utility.

As with the home so with the office and factory. The small workshop or business establishment accommodated within one or two rooms records its proportion of waste, but it apparently is so slender as to be comparatively insignificant. Furthermore, as a rule, it is so varied as to aggravate the thought of being more nuisance than it is worth. Accordingly, the refuse is neither sorted nor retained, but, especially if it be combustible, meets with an untimely end. On the other hand, in the large factory, the accumulations being of distinct magnitude, segregation and careful retention are observed to facilitate ready sale, while arrangements are even completed for the periodical clearance of the refuse at

mutually satisfactory if not prevailing market prices. Whether the waste ever commands its real intrinsic value is a matter of opinion, because we have never been persuaded to regard the residue disposal problem in the strict commercial sense.

Reflection gives rise to the question—What is waste? A more appropriate explanation than a paraphrase of Palmerston's famous dictum concerning dirt would be difficult to find. Waste is merely raw material in the wrong place. In the spirit fostered by our traditional improvidence we have sought to adapt another existing term to meet the situation. We glibly dismiss waste as rubbish. It is not, but because we have been too indolent to occupy our minds in the elaboration of further possible applications for what we do not actually require for conduct of the operations with which our individual exertions are identified, we seek to satisfy our consciences in the easiest manner. In so doing we essay to flout a fundamental law of Nature—the indestructibility of matter. We have failed to appreciate that what may be of no immediate value to ourselves may, indeed can, with judicious and scientific handling be persuaded to serve in the capacity of indispensable raw material to other ranges of endeavour. It may even go so far as to supply the wherewithal for the creation of new industries, widening the possible fields of employment, and contribute pronouncedly towards the wealth of the nation.

This fact can be brought home very conclusively. In the opening days of this century the amount of fats, oils, and greases which were allowed to run to waste was colossal. They were cheap commodities and, although they occur in greater or lesser degree with the majority of organic materials in popular request, not a thought was expended upon the possible losses which their discard with so-called wastes represented. But, during the past few years,

the demand for these substances has advanced by leaps and bounds. They have become vital to the table in several forms, and this request has brought the food-producing industry into conflict with another trade of far-reaching importance, namely, the manufacture of soap. The situation is rather peculiar, as I point out in a subsequent chapter. Some idea of the volume of fats absorbed in the preparation of margarine and soap, respectively, may be gathered from the narration of the fact that one of the largest soap manufactories in the world demands the supply of fat in a steady stream of about 5,000 tons per week.

A few years ago the activities of this particular firm were concentrated upon the manufacture of soap. It was the solitary product. But it had its attention attracted to the growth and possibilities of the margarine trade, and it decided to enter this market. To-day, its activities are divided between the production of the two commodities, and, curiously enough, almost equally. From its works issue out about 6,000 tons of soap and 4,000 tons of margarine every week.

This merely represents the endeavours of one firm. There are scores of others following a similar line of action. The result is that the demand for fats has reached an unprecedented level. At the moment of writing the coarsest grade of fat is able to command approximately £50—\$250—a ton. Is it surprising therefore that every effort should now be made to extract the fats, grease, and oil associated with every form of organic waste, and that keen effort should be made to secure increasing quantities of waste capable of yielding this material?

So far as the public is concerned this spirited search for fat may be regarded with misgiving, if not absolute alarm. The wizardry of the

chemist is acknowledged, and the thought possibly prevails that much of the fat now being turned into margarine is really only fitted for the production of soap. But alarmist or pessimistic feelings in this direction may be speedily allayed, though it is permissible to point out that ten years ago much fat was turned into the cleanser which should have been utilized as a foodstuff, inasmuch as its freshness and wholesomeness were above all criticism. It was merely turned over to the soap-maker because no alternative application was apparent. But conceding the magical qualifications of the chemist, there are some feats which yet remain beyond his powers. The ability to turn bad fat into good for dietetic purposes must be numbered among those achievements which as yet have proved impracticable. If a fat be rancid it cannot possibly be reconditioned for edible purposes. No matter how its preparation may be coaxed and nursed it cannot be converted into a foodstuff. The palate would detect rancidity instantly. Consequently, only the highest grades of animal fat are used for the preparation of margarine; the fact that the big-scale production of a food should have been embraced by the soap-maker merely represents one of those inexplicable coincidences of industry.

It is distinctly interesting, if not actually amusing, to follow what may be described as the utilitarian conjugation of waste. It remains an incubus, if not an unmitigated nuisance, until the chemist, or some other keenly observant individual possessed of a fertile mind, comes along to rake it over and to indulge in experiments. Such efforts are often followed with ill-concealed amusement. A few years since they were even regarded as so much waste of time. In due course some definite conclusion is reached, and the fact becomes driven home that, if such-and-such a process be followed a particular spurned refuse can be utilized as raw material for the

production of some specific article. Then scepticism and amusement give way to intense interest and speculative rumination. The new idea is submitted to the stern test of practical application upon a commercial basis, while the financial end of the proposal, which is the determining factor, is carefully weighed.

These complex issues being satisfactorily settled the exploitation of the erstwhile waste, or rubbish, is energetically pursued. It has now become a potentially valuable by-product, and, accordingly, must be worked for all it is worth. Firmly entrenched upon the market development is vigorously pursued, often to culminate in the quondam waste, now an established by-product, being lifted to such a position of commercial eminence as to dispute premier recognition with the staple in the production of which it is incurred. In more than one instance the by-product has even eclipsed the primary product, or at least attained a level of equal importance, while occasionally the staple has even suffered virtual deposition to rank as little else but a by-product. There are even some cases on record where the manufacture of the staple has been abandoned, at all events for a time, because the by-product, the former incubus of the industry has become invested with such far-reaching importance as to demand the concentration of effort upon its production. Waste—by-product—staple: such constitutes the brief evolution of more than one of the world's leading lines of trading.

Many instances of remarkable topsy-turvydom in this connection might be cited. Possibly one of the most impressive illustrations in this respect, although the transposition is not yet quite complete, is offered by coal-gas. When Clayton first demonstrated the practicability of extracting illuminating gas from coal commercialism feverishly set to work to exploit the gas, and gas only. But the gas proved to be associated with a variety of

substances which threatened the very future of Clayton's discovery. Ammonia fumes poisoned the atmosphere of the room in which the gas was burned to the grave danger of the health—even lives—of the occupants according to the cynics, critics, and caricaturists of the day. The tar carried in suspension in the gas was every whit as exasperating because it condensed in the mains to choke them. Ammonia and tar became the bane of life to the gas-engineers of the period, harassing them to the verge of endurance, while the elimination of the two deleterious substances involved the expenditure of enormous sums of money and prodigious thought.

What is the position to-day. Gas, the staple product from the distillation of coal three-quarters of a century ago, now, to all intents and purposes, is the by-product. The world could roll along very comfortably without it. Indeed, we may have to do so in the near future when the gas is stripped of every other marketable constituent, leaving only a mixture of methane and hydrogen gases to be burned under boilers to raise steam for the generation of electricity in enormous bulk. The ammonia which formerly jeopardized health and lives, and to remove and to throw away which the pioneer engineers strained every nerve, is now trapped to be converted into fertilizer. Then the tar which likewise nearly drove the engineers frantic is now carefully drawn off, collected and resolved into a host of wonderful articles to furnish a diversity of indispensable materials. It would be wearisome to recite the list. It is so lengthy. But it would seem as if the by-products of coal touch every other industry, ranging from dyes to chemicals, flavourings to disinfectants, perfumes to therapeutics and soporifics.

As with coal so with oil. Forty years ago the boring of a well was followed with mixed feelings by the indefatigable driller. A

“strike,” while devoutly to be desired, was just as likely to bring dreadful disaster swift and sudden, even death, as wealth untold. The driller probed the earth animated by one idea. This was to tap the subterranean lake of crude petroleum. But in driving his bore the driller invariably crashed through the roof of an underground reservoir of petroleum gas. Ignorant of the value of this product, though painfully aware of its danger if allowed to break away and to get beyond control, the early seekers for oil led this gas through a pipe to a point some distance away. There the flow from the open end was ignited and the gas allowed to burn merrily in the open air. The driller knew no peace of mind until the flame flickered and expired as a result of the exhaustion of the subterranean gasometer. Then, and not until, he could resume his boring for the precious liquid with complacency.

But with passing years and progress came enlightenment. The gas is no longer wasted; it is trapped. In some instances it is led through piping for hundreds of miles to feed hungry furnaces engaged in the making of steel and other products. The earth is even being drilled, not for petroleum, but for its huge supplies of natural gas, and the huge reservoirs thus discovered are being harnessed to the thousand wheels of industry. We even find trains fitted with cylinders carrying natural gas stored under high pressure to furnish light for the convenience of passengers, and to enable dainty meals to be cooked in the kitchens of the dining-cars.

The oil refineries, upon receiving the crude petroleum, set out to recover as much paraffin as they could. This was the primary product, because a brilliant British chemist, Young, had discovered how to distil paraffin from petroleum for lighting, heating, and cooking. It represented a huge advance upon the lamp dependent upon whale oil and the tallow dip. But before the refiners could

reach the paraffin they were called upon to wrestle with a lighter spirit which sorely harassed and perplexed them. It was extremely volatile, and highly inflammable—even explosive in the vapour form when mixed with air—and accordingly was construed into a menace to the refinery. It was carefully drawn off and dumped into large pits, where it was burned merely to get rid of it. Its commercial value was set down as nil. A certain quantity was used by laundries and dry-cleaners because of its striking cleansing qualities, but it was used sparingly and cautiously owing to its dangerous character. It could be purchased only with difficulty, and in small quantities by the members of the public, the retailers for the most part being chemists and druggists. If one were glib of tongue and a master of the persuasive art, one might succeed in obtaining as much as half-a-pint in a single purchase.

Suddenly a creative mind evolved the high-speed internal combustion engine, which heralded the coming of the motor-car, the submarine, and more recently the aeroplane and airship. The volatile spirit which hitherto had been spurned and burned wastefully by the refineries was immediately discovered to be invested with a value which had heretofore escaped attention. It formed the ideal fuel for the new motor. Forthwith wanton destruction of the volatile spirit was abandoned. Every drop was carefully collected, and, as time went on and the demand for the light liquid fuel increased, the refiners put forth greater effort to wring every possible dram of petrol from the crude petroleum. Paraffin, which had hitherto been regarded as the staple, was ignored. It even dropped in commercial estimation as a by-product and became a drug on the market, although, fortunately, the refineries hesitated from repeating the practice they had honoured in regard to petrol—summary destruction by fire.

So insistent and overwhelming has grown the demand for petrol that the producers are hard put to it to keep pace with the requirements. A petroleum boom has reverberated around the world, eclipsing in intensity any stampede identified with the search for gold. To these islands the petroleum age has contributed very little wealth, although it has been responsible for revived interest in the exploitation of our shale—another form of waste—but to Russia, the United States of America, Mexico, and the East, where the earth reeks with petroleum, it has brought wealth untold. It has completely transformed the economic outlook of certain nations, and in some instances has served to rescue a country from bankruptcy. To us it is of appreciable significance because, so far, we have been compelled to draw upon distant sources for our requirements and so have to contribute to the national wealth of others, some of whom are our most spirited rivals in trade.

In 1913 our imports of petroleum products aggregated 488,106,963 gallons, valued at £10,856,806—\$54,284,030—the contribution from Greater Britain being 22,172,701 gallons, valued at £829,868—\$4,149,340. Of this enormous volume 100,858,017 gallons represented petrol for our motors—the waste product of forty years ago at the refineries—for which we had to pay £3,803,397—\$19,016,985. In the year when mechanical road propulsion was ushered in petrol could be obtained for about 4d.—8 cents—a gallon: in 1918 it commanded 3s. 6d.—84 cents—a gallon. An increase of over 900 per cent. in value within approximately 35 years represents no mean achievement in commercial expansion, but when it relates to an erstwhile waste product the record is far more sensational.

To relate all the fortunes which have been amassed from the commercialization of what was once rejected and valueless would

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