INSTITUTE OF MARINE ENGINEERS

INCORPORATED

SESSION 1906-1907

President: THE RIGHT HON. W. J. PIRRIE.

VOL. XVIII.

PAPER NO. CXXX.

THE RECOVERY OF WASTE PRODUCTS

BY

MR. H. BERTRAM
(Hon. Min. Sec.)

Monday, March 26th, 1906,

CHAIRMAN: MR. W. LAWRIE (Member of Council)

AND

A REVIEW OF THE BELLEVILLE BOILER QUESTION

BY

MR. F. J. KEAN, B.Sc. (LOND.)

Monday, April 23rd, 1906,

CHAIRMAN: MR. W. C. ROBERTS, R.N.R. (CHAIRMAN OF COUNCIL).

INSTITUTE OF MARINE ENGINEERS

INCORPORATED

SESSION  1906-7

President : THE RIGHT HON. W. J. PIRRIE.

Hon. Treasurer : A. H. MATHER. *Hon. Secretary :* JAS. ADAMSON.

Members of Council :—

GEO. ADAMS.
J. BLELLOCH.
JOHN CLARK.
F. COOPER, R.N.R.
J. E. ELMSLIE.
J. G. HAWTHORN.
D. HULME.
J. LANG, R.N.R.
W. LAWRIE.
JOHN MCLAREN.
J. R. RUTHVEN.
W. J. TAYLOR.

W. C. ROBERTS, R.N.R.—*Chairman.*

Hon. Financial Secretary : E. W. ROSS. *Hon. Min. Secretary :* H. BERTRAM.

Conveners of Committees :—

F. COOPER, Presscuttings.
J. E. ELMSLIE, Issue of Transactions
D. HULME, Reading Room.
W. LAWRIE, Library.
JOHN MCLAREN, Property.
WM. MCLAREN, Experimental.
J. R. RUTHVEN, Papers.
W. J. TAYLOR, Recreation.

Vice-Presidents :—

C. ANDERSON (Bombay).
P. BOYD, R.N.R. (Sea service).
W. BLACK (S. America).
W. BROCK (Dumbarton).
A. BOYLE (London).
P. T. CAIRD (Greenock).
A. J. DAY (Southampton).
P. DENNY (Dumbarton).
J. G. DOBBIE (Glasgow).
Engr. Capt. R. W. EDWARDS, R.N.
Prof. A. C. ELLIOTT, D.Sc. (Cardiff).
E. ELLIOTT (Bombay).
T. W. FISH (Calcutta).
J. M. GRAY (Edinburgh).
Sir A. S. HASLAM (Derby).
W. W. HOUFE (China).
ROBT. LESLIE, R.N.R. (London).
J. LOCKIE (Leith).
W. MCLAREN (London).
J. NEILSON (Calcutta).
W. PRATTEN (Belfast).
F. M. RICHARDSON (B. Columbia).
J. W. RICHARDSON (Liverpool).
J. SHIRRA (Australasia).
J. STEWART (Newcastle).
C. SLATER (Sea Service).
W. TOSH (Africa).
J. STEVENSON (Sea Service).
F. P. WALLACE (Southampton).
J. WEIR (Glasgow).

INSTITUTE OF MARINE ENGINEERS

INCORPORATED

SESSION  1906-7

PRESIDENT: THE RIGHT HON. W. J. PIRRIE.

VOLUME XVIII

58, ROMFORD ROAD, STRATFORD,
March 26th, 1906.

A MEETING of the Institute of Marine Engineers was held here this evening, presided over by Mr. W. Lawrie (Member of Council), when Mr. H. Bertram (Hon. Min. Sec.) read a paper on "The Recovery of Waste Products." A discussion followed. It was announced that "A Review of the Belleville Boiler Question" would be given by Mr. F. J. Kean, B.Sc., at a meeting on April 23rd.

JAS. ADAMSON,
Hon. Secretary.

PAPER NO. CXXX.

The Recovery of Waste Products

By Mr. H. BERTRAM (*Hon. Min. Sec.*)

READ AT

58, Romford Road, Stratford,

On Monday, March 26th, 1906.

Chairman: Mr. W. LAWRIE, Member of Council.

The old maxim, "Waste not, want not," is more observed by the present generation than the majority of old-fashioned people give it credit for; in fact, it is being enforced daily in the ceaseless competition for wealth. Our thrifty ancestors would have been horrified, had they known the amount of their wastefulness. Take for instance, animal waste: they killed an ox, ate the meat, made shoes of the hide, cups of the horns, and regarded the remainder as useless. To-day an ox furnishes meat, leather, hair for the plasterer, horn for cups and combs, hoofs for buttons, and dye-making, bones for tooth brush handles and manure making, grease for soap making, and blood which for its albumen is used to clarify sugar. These are by no means all the uses to which the ox is put: but they will serve to show how time changes our notions of what waste really means.

The utilization of what was formerly wasted, has now become so general, that a use seems to come into being almost at the same time as the supposed waste. The conversion of the slag heap into silicon cotton, and the pit heap into shale oil, are familiar examples of the use of material which was deemed absolutely useless. Almost any trade will give us examples of uses found for its refuse, and a new trade seems to spring up where the other leaves off. We have not yet reached a point where we can say that nothing is wasted, and a great deal of matter is now thrown away as useless, which may one day be brought into the eternal round of change again. Nature never seems to waste anything. The withered leaves provide manure as do the remains of the animal world, and are again absorbed by the plant, which in turn is eaten by the animal. Dr Lyon

Playfair said that : " Chemistry, like a prudent housewife, economises every scrap," and to such a pitch has the utilization of waste products arrived in the chemical world, that I have been informed that a well-known firm in London put down a plant to produce what had been a bye-product, and the original product became the bye-product. I refer to glycerine. A true chemist has tears in his eyes, when he thinks of the years that crude glycerine was emptied into the sewer. From the tinsmith's clippings, and the parings of horses' hoofs,the chemist makes lovely dyes. The refuse from the gas-works he makes into delicate perfumes, lovely dyes, and the sweetest known substance, saccharine.

Another example of the utilization of waste is found in the dust destructor. Dr. Koller, in his article on " The Utilization of Town Refuse," says : " The system is considered the best in which the destructor is composed of a group of furnaces in the form of cells, generally six in number, built of firebrick, and covered by an arch, which forms the top of the reverberatory furnace. The dust is emptied into an immense hopper at the top, from which it passes after being rapidly dried, on to grates similar to those of boilers, in the lower part of the apparatus, where it is burnt. About every twenty minutes a fresh charge is let down and burnt. On the average, each cell of the destructor, in which the fire is never extinguished, burns from 30 to 35 tons of dust per week. The ash and clinker from the furnaces are ground, and mixed with one-third of their volume of hydraulic lime, thus forming a blackish cement, not of very agreeable appearance, but selling at about 8*s*. per ton, and used in buildings for staircases, and especially for drains. The specially valuable part of the process lies, however, in the utilization of the heat in the production of steam.

" With a good apparatus, each cell of the destructor gives 10 H.P. which is obtained from a boiler immediately attached to the destructor. At Southampton, the steam produced by the destructor compresses air, by which the sewage is raised, and carried away ; at the same time it produces energy for an electric lighting installation."

It would be impossible to enumerate to-night one-hundredth part of the saving that is being effected daily by the use of waste material, but I will endeavour to describe a new process by which cleaning cloths, cotton waste, and any other material

used in the engine room for wiping purposes, may be made to give up their oil, which is again brought into use, providing an excellent axle grease from the residue, while after being washed, the cloths proceed on the round again and again until the fibre of which they are composed is no longer fit for the purpose.

There is a process in vogue on the Continent for recovering oil from cleaning cloths, and I will briefly describe it to show the difference in the two methods, quoting a few paragraphs descriptive of the process by Dr. Kohler, who states :—The used cloths are squeezed fairly tight into a sheet iron cylinder, provided with a tap at the bottom, and with an air-tight lid. Before the lid is put on, so much petroleum ether, or benzine, is poured over the cloths, that, after they are saturated, the solvent quite covers them. The lid is then put in place, and the vessel left for twelve hours. The tap on a pipe, about two yards long, attached to the lid, is then opened ; water is run in through this pipe, and the lower tap opened. The solution of the solvent runs off ; water is added through the pipe until nothing but pure water runs away below. The solution of the lubricant is then brought into a distilling apparatus, the still of which stands in a pan of water. The water is then heated to boiling. Since both the solvents mentioned have a boiling point below that of water, they evaporate completely, and can be regained by cooling the vapours. The lubricant, which was dissolved from the cloths, remains in the still in a fluid condition.

For some time now, a process has been in vogue of de-greasing bones by immersing them in benzine, then subjecting them to heat, and it occurred to Mr. Godfrey Hall, one of the Directors of Messrs. E. Cook & Co., of Bow, that it might be possible to de-grease other materials. He experimented, and after assuring himself that he was right, at once took out a patent for the process. But a laboratory and a works experiment are often two very different things, as no doubt many of my hearers have discovered, and it was found that while the benzine penetrated to the centre of the bones, owing to their irregular shape causing passages between them, it would not penetrate a heap of sponge cloths, or waste.

An arrangement was at length devised by which a large quantity of material could be treated at once, and yet kept sufficiently apart to allow the benzine to do its work thoroughly.

It was necessary to erect a plant which could be readily worked by one man, and which to a large extent would be automatic. A general outline of the plant was placed by Messrs. Cook before Messrs. Caird and Rayner, with the result that the plant was handling 100 gross of cloths per week, within three months of its inception. Before describing the plant, I might briefly describe its action.

First :—Benzine, as you are all aware, is one of the best solvents known, and has an affinity for grease of any description. It is also volatile at ordinary temperatures, and of these two characteristics we take full advantage. The cloths, which come from the users in the condition in which you see them here, are placed in a vehicle, which, for want of a better name, is termed the carrier, being a series of perforated trays, carried on a central stalk of perforated tubing This is then lowered into a cylinder having a hinged cover, and containing a series of open and closed steam coils. The cover is lowered and made tight with a number of butterfly nuts. Benzine is then poured in through a pipe near the top of the cylinder, connected to the bottom of another cylinder, called the container. Heat is now applied by passing steam through the closed coils, and a dense vapour arises from the benzine, combining with the oil contained in the cloths, condensing, and carrying the oil with it, as it falls to the bottom of the extractor. This continues until the oil and grease has all been conveyed to the bottom ; the time required being regulated by the number of cloths to be de-greased, and the temperature of the steam in the coils. A point is reached eventually, when the temperature of the vessel will not allow of the benzine condensing, and it consequently expands until it fills the pipe leading to the condenser, then the condenser itself. A partial vacuum is formed, and condensation is very rapid, owing to the low boiling point of the benzine. From the condenser, the liquid falls into the separator, so called, because, in the later stages of the process of distilling, a quantity of steam is generated, which, for economy, it is necessary to remove from the benzine. From the separator it runs into the container, and is ready to start on its round again. We will now return to the oil left in the extractor. After the benzine has been entirely driven off, a cock is opened in the bottom of the extractor, and the liquid contents allowed to run into the blower. Here it is again boiled, to drive off any traces of benzine, and then thor-

oughly agitated by an open steam coil. As the capacity of the blower is many times the charge of the extractor, a large quantity of oil, and water, mixed with carbon, is allowed to settle during the week end, and on Monday morning the lower part of the blower's contents is run to waste, as a profitable use has not yet been found for it. The remainder, consisting of oil and finely divided carbon, is blown from this vessel into tanks, by admitting steam above the surface. The oil is run off as required, treated by a cheap and simple chemical process, and, as you see it here, can be put on the market again. The residue forms an excellent axle grease, which can be sold at ½*d.* per lb. and which I have tried myself with success as a slow speed shafting lubricant.

Now for the cloths which we left in the extractor. The carrier is raised, and the cloths are found to be hot, dry, and dusty. After a vigorous shake, they are passed into a washer, then from the drying-room they are despatched on their rounds again. During the whole process, there is absolutely no wear on the cloths, until they reach the washer, the benzine seemingly touching them without disturbing a fibre, in fact, I believe it would pay large cleaning works to erect a plant for the saving in benzine alone. The process would also be useful in extracting oil from fish refuse in a cannery, and perhaps copra could be more rapidly and economically treated by this method, as the benzine seems to have no perceptible effect on the oil produced. The substitution of sponge cloths for cotton waste, for cleaning, by large consumers, such as Railways, and Steam Ship Companies, Electricity Generating Stations,large Engineering shops, etc., has long been found to be an economy, as well as diminishing the danger from spontaneous combustion of oily waste when exposed to air on the rubbish heaps, as was too often the case. By this method a further economy seems easy to attain. Even the sponge cloth manufacturer may be said to benefit, as undoubtedly a cloth of better quality, and consequent higher first cost, would be a better purchase from the consumer's point of view, than the cheap cloth, as its useful life would be considerably longer. Of course the plant did not arrive at its semi-automatic working without many failures. A road that many have passed over, is easier to follow than no road at all, and one is bound to encounter obstacles in starting a new plant. I have given you an outline of the process, but the successful working was altogether due to a foreknowledge of

the peculiarities of the benzine by Mr. Godfrey Hall. I have here samples of the cloths as received for cleaning, as taken from the extractor, and as washed, ready for return. I may say that these cloths have been returned not less than ten times. I have also samples to show you of the oil as it comes from the blower, as it is after chemical treatment, and of the axle grease residue. This little paper has been given to show that there are still fields open to the inventor who turns his attention to waste and its prevention.

The CHAIRMAN remarked that although Mr. Bertram had told them they had not yet arrived at the point at which there was no waste, it was quite clear that they were getting towards that point. Many of the members present would be able to give them further information on the subject, or, at any rate, raise questions for Mr. Bertram to answer.

Mr. JAMES ADAMSON (Hon. Secretary) said he thought Mr. Bertram had been harder upon their grandmothers than they deserved, as if their forefathers had not discovered that soap could be made from fat, then the soap-makers would not be so far advanced as they were at the present time ; what they knew to-day had grown from the rudimentary teaching of the past. In some remote parts he had no doubt soap was still actually made at the farmhouses, where the myrmidons of the soap manufacturers had not been able to penetrate. Not only in connection with soap-making, but in many other things, our forefathers had employed themselves, leaving us the legacy of their discoveries. There were many domestic appliances for making household articles, known to and used by our great-grandmothers which were utterly unknown to the present generation. He only uttered those few remarks in defence of their ancestors, to whom they owed the rudiments of much they now enjoyed in fuller volume. Every one had doubtless seen at different periods of their lives, and at different places they had visited, how various products were manufactured from otherwise waste material, and he dared say, as Mr. Bertram had remarked, that was becoming more and more manifest every day. Peat from bog and uncultivated land was being gradually brought into a manufactured state for use in house and factory. A use was also found for those *heaps of material* which, in the days of boyhood no doubt, had excited their curiosity, when they saw the vast accumulations

at the coal pit heads, as to whether such would ever be utilized. They now knew that those heaps were being gradually worked up into useful products.

At their fuel-testing experiments on Monday nights they had also from time to time experimented upon certain samples of fuel which showed them that the spirit of the inventor had not only gone into legitimate channels, but also, in some instances, into regions where he had no business. Members who visited the Institute on Monday nights at their fuel testing knew that now and again they got samples of fuels prepared from substances that would otherwise have been lost. They had come upon instances where the inventor had endeavoured to persuade capitalists that if they would only put their money into a certain fuel manufacturing business of which he as an inventor held the secret, their fortunes were made. The tests and researches made in connection with some of these cases had shown the capitalists that the " invention " was only profitable to the inventor in direct proportion to the time they paid him to experiment. They had thus to distinguish between the legitimate and the illegitimate trader, that was to say, they had to discriminate between the man who was genuine, whose samples were genuine, and of what value they were in the market, and the man who sought by every and any means to prey upon his fellows.

He had heard of a firm who offered to purchase oil and grease scraped from the crank pits and bilges of steamers ; he did not know for what purpose, whether it was to be treated in a similar manner to that described by Mr. Bertram.

There was a good deal of labour involved in collecting the oil, and in one case he knew of where samples were sent to the firm in question, these did not come up to requirements, and the material would not have paid cost of carriage. Efforts were then made to dispose of it elsewhere, and ultimately it was sold at a price which about covered the cost of the drums it was placed in. Perhaps Mr. Bertram, as one of the results of his paper, may be able to find a use for what he had indicated. Mr. Bertram had not brought a sample of the cleaned waste, but he understood that could also be dealt with. Sometimes there was a suspicion that consignments of waste that were delivered, not up to sample, had been already used and cleaned. The samples of sponge cloths before them, however, would hardly pass muster for new, even with a big margin ;

they were, notwithstanding, of service, although they had been through the mill, as stated, several times.

There was also another product which was probably the most difficult problem they had to deal with in connection with every-day life. It was, perhaps, a little beyond the intended scope of their present subject, but the question was forced upon them day by day, both individually and collectively, that was—how to deal with what might be termed waste products of humanity, or as they have been termed colloquially "Wasters," the colonial type being termed "Sundowners."

The recovery of such was not only a difficult problem, but one which demanded the highest and noblest intelligence to deal with. The recovery of such came into thought when they saw so much bread and butter thrown away, and that was one of the worst features in connection with what he had referred to. Although it was apart from their subject he thought it was a question they should all try and ponder over, and face. The difficulty was a growing one, and the sooner they tackled it the better. The more they thought about it, the more were they likely to be able to throw the weight of their influence in order to try and make betterment of the distressing circumstances in the lower strata of social life.

There was another aspect of the question also: he was talking with a gentleman that day who employed a large number of men, as to the prices in London and in different parts of the country, and the effect of forcing wages up, with the consequent greater expense of living in London. When they considered the great amount of waste in connection with their social life, he thought some improvement in that department might be made in the direction of recovery. No doubt the School Board and the cookery classes were doing something, at any rate, to make things better, and there was room for improvement.

From the wasteful way in which food was in many cases cooked and in others thrown away, there was no wonder that their mode of living was far more expensive than it ought to be, as compared with our competitors on the Continent. Then, again, in connection with our sailors and firemen, they knew that the expense of feeding British firemen and sailors was greater than the cost for feeding the continental or eastern seamen and firemen probably in the proportion of 100 to 70 and to 30 respectively.

The question of food trenched very closely on the subject which Mr. Bertram had put before them that night. He had appreciated the paper very much, and he saw a great outcome for other papers from it, and he hoped that might be one result from the paper which Mr. Bertram had so kindly read to them.

Mr. J. H. SILLEY asked if the trays which held the sponge cloths were movable or stationary. Did the benzine pass up through them ?

Mr. BERTRAM said that the benzine passed up through the central tube and flowed on to the cloths.

Mr. SILLEY said he should have thought it would have been better if the trays had been movable.

Mr. BERTRAM said the benzine vapour was in motion, but the cloths remained perfectly still.

Mr. SILLEY remarked he had seen the idea carried out in New Zealand a dozen years ago, where they had a process for boiling the old waste and sponge cloths. He did not think the idea was altogether new. What he referred to was being done in New Zealand quite twelve or fifteen years ago. He did not think they would be able to use it to the same extent on board ship as on shore. Mr. Adamson had referred to the oil taken from the bilges. He thought if they saved the oil from the bilges they would pay for it in white paint. If they allowed the oil to gather in the bilges the paintwork would suffer. The best idea was to keep the bilges as clean as possible, using lime and cement wash.

Mr. E. W. ROSS said the subject was such a wide one that they could deviate from Mr. Bertram's paper very considerably. Mr. Silley had remarked that the idea of cleaning sponge cloths was not a new one. He himself could remember in his apprenticeship days they used to boil them, and the water was used for the tools. Dirt, or dust, or old material was only "matter in the wrong place," and much of it could be put to good use if properly treated. The cotton waste, so valuable for engine cleaning purposes was but a waste product of our cotton mills, although it was still a valuable adjunct to the

engine room, when nothing so expensive as the " sweat-cloth " was desired. He believed there was much valuable tin collected from the old tin cans and vessels used for preserved eatables, etc., now so largely put upon the market. The conglomeration of old material was compressed by special machinery, perforated at the same time by spikes ; these made through holes in the mass, which was then suitably heated to melt off the tin deposited on the metal—surely a valuable product from such wastages. From coal came many articles, some of which used to be treated as waste, and were got rid of to the best advantage, but with little or no profit. Nowadays they were still got rid of, but to great advantage, and were a great source of profit. They had such valuable by-products as saccharine, tar, coke, aniline dyes, etc., aiding our chemists ; in saccharine, useful for hygienic purposes, and a preservative against the inroads upon nature; in tar, valuable in the manufactures ; in coke ; and—useful and pleasing to the eye—in aniline dyes. From what were formerly useless dredgings from London Docks, bricks were now made, again a useful return from waste to useful purpose. The waste slag from dust destructors was cast into suitable shape, and, in one instance he knew, was used in the building of a sea wall at one of our sea coast watering places. The waste products of our coal mining industry, the slack coal which laid in immense heaps around the pit mouths, was a source of wealth if properly handled. From time to time companies had started to use it up in the shape of block fuel, but judging from its meagre use, it did not appear to have reached perfection. Some tests had been made at the Institute on some special samples of block fuel which showed a wide difference of evaporative power. Other samples of waste which were being turned into use for the comfort and use of man were cork cuttings, used in various ways, either as cork dust, sprinkled on iron bulkhead plates on board ship as a preservative, or as a preventative against sweating ; while in the shape of cork carpet or linoleum it was found in the home. Again, old cotton or linen cuttings were turned into valuable account as paper. Wood pulp, of which large quantities came from America, and which was the refuse of saw mills, was also turned into use, in the shape of millboard for boxes and paper. But really the cases were so numerous and commonplace, where waste could be turned into utility, that it was almost safe to say there was nothing

coming from a specified product but what could be turned into some use in the service of man.

Mr. W. McLaren said that, like Mr. Ross, he had had experience of washing sponge-cloths when he was a youngster. They had to wash the sponge cloths, and whether it was in order that, when washed, they should be better than waste, he was too young to consider. He would like to ask Mr. Bertram what was the cost of the sponge cloths per dozen or per gross, such as those shown that night. Those cloths were very small and were very closely woven in the centre. Were they specially made for rewashing, and so forth ? Was there any shrinkage in them ? They seemed to be very small as compared with the average ones. If they bought a single sponge cloth they got a very good one for 2*d*. Then, coming more directly to the question before them, if Mr. Bertram was at liberty to do so, it would be interesting to the members to hear some further reference to the manufacture of glycerine. It would be interesting to know where glycerine had been manufactured and soap taken as a by-product—at least so he inferred from the note by Mr. Bertram in the paper. In the course of their Saturday afternoon visits to works they had seen waste products mixed with small coal and used for generating steam—this was specially interesting at the works of Messrs. Bennet Lawes, Millwall. Various classes of fuel, in the shape of bricks or balls had been manufactured recently, some of which were in the market at the present time. He thought some gave an evaporative power of about 4 or 5 lbs. of water per lb. of rubbish they were burning. The small coal at the pit-mouths used to be disregarded, but it was now selling at about 10*s*. or 12*s*. per ton in London by rail, but 2*s*. to 3*s*. less by water delivery ; while coal dust, mixed with crude oil, was now being manufactured into brickettes. Mr. Adamson had referred to the cost, and waste of, food on board ship. That had been a trouble from time to time at sea, partly due to bad cooking, and what was thrown away. But they must not forget that, with British seamen, they had a different class of man to deal with than with the foreigner. The Eastern or even continental people did not feed the same as our countrymen. When he was abroad for four or five months he found it cost him as much to live here in this country as what the best mechanic was earning per week, so that the conditions in

which people had been reared, and the amount of work that was expected of them, was something to be considered in regard to the cost of British firemen and seamen.

Mr. D. HULME said he thought that so far as oil in the bilges was concerned, some chemical might be used to solidify the oil so that it might be collected, brought out, passed through the evaporators, and regenerated. Speaking of other waste products, he remarked that Mr. Ross had referred to the collecting of old tins, and tin cuttings. That utilization process was carried out by means of electric heating. The plates were perforated, and he thought they paid 3*s*. per cwt. for the cuttings, and they got 9*s*. for the tin they collected from it. It was easy to imagine the amount they had to deal with to make any profit. Mr. Adamson had referred to the qualities of cotton waste. He thought the waste merchants who contracted to supply usually specified that it was fresh from the mills. At the present time he thought some firms were using sheep cloths for wiping down engines. He had himself found that in cleaning the sheep cloths they could keep the same consistency of fibre, better than they could with the ordinary sweat-rags. Under the process which Mr. Bertram had described the fibre was practically kept the same for a considerable period. Sheep cloths could be bought for 30*s*. per 100, and he had found them a great saving as compared with the ordinary rags. He believed that Messrs Donald Currie and Co. were using them at present, buying them by the ton. He thought that, so far as the utilization of waste products was concerned, there were many substances that they might make use of, if they could find the means, which would result in economy, give a profit to the individual, and a benefit to the community. He might mention that he knew of a machine, now in use, which was employed in tearing up old cast-off shirts.

Mr. WEBSTER (visitor) said he was pleased to be present that evening on the invitation of Mr. Adamson, for there was always something very refreshing in being in the company of engineers. On those occasions he generally learnt something, and he must say that he had learnt something that night. Strict economy in the use of stores of every kind was more than ever necessary if they were to compete with those nations

who seemed to have the knack of using everything to advantage. The Germans in private life seemed to be far more frugal than the British were, and they appeared to carry out that disposition in their commercial life. One could not but be surprised that Britons did not turn their attention more closely to the economical methods practised by some of our continental neighbours. By doing so, some industries would be more lucrative, and there would be far less possibility of some trades leaving our country. Probably one of the reasons why it cost more to feed British sailors than continental sailors was because the foreigners employed better cooks. He thought the food put before our sailors and firemen was often spoiled in the cooking. He believed that great economy could be effected if the cooks were better qualified for their work and took more interest in it.

Mr. D. HULME, referring to the utilization of street refuse, said that in some districts women were paid for sorting this out, the valueless portion being taken to Rochester and burned.

The CHAIRMAN said the subject was an interesting one, and it brought home to them that they yet saw a good deal of waste going on. The point which appealed to him was this : Which was the best way to get the waste turned into money ?

If the sponge cloths, when they were dirty and full of oil, could be collected and sent to any particular works, and the oil extracted, as described by Mr. Bertram, he thought the subject would be one to which engineers ought to give serious consideration. Mr. Adamson had spoken of extracting oil from the bilges, but he thought there was a greater field in extracting oil from the sponge cloths. He would like to ask Mr. Bertram which was the best medium for extracting oil from the sponge cloths, or ordinary cotton waste ?

Mr. BERTRAM in reply, said no old waste after being cleaned and washed in the way described for sponge cloths had ever been resold for new, as no waste had, other than experimentally as yet, been passed through the process. They knew that waste could be treated in the same way as sponge cloths, because they had tried the process on waste and other materials. Referring to the appearance of the sample sponge cloths he had with him, and which had been degreased, he said that it was

almost impossible to get them to look quite clean because of the large amount of dirt which had been engrained in them. The cloths, when sent to the degreasing machine, were ten times as black as they saw them, so that they would, no doubt, admit it spoke well for the plant that it should get them as clean as it did. What he had described was a new process entirely, on the basis of the extraction of the oil under heat. There was a process in vogue on the Continent, in which the oil was taken out by using cold benzine. That, however, was a lengthy process, as the sponge cloths lay twelve hours in the benzine It was also costly, as they had to distil an enormous quantity of water before they recovered the benzine or oil. The process referred to in his paper was worked by one labourer, supervised by the manager of that department. To make the process pay, it had to be done on a large scale. It would never pay on board ship, but the sponge cloths could be saved up to the end of the voyage, and then treated, when they could be used again and again. The sponge cloths he had with him had been degreased and were perfectly clean. Mr. Ross had thought that sponge cloths would be more expensive than waste, but his experience was that sponge cloths were less expensive than waste. They had not yet treated any bulk of waste in the cleaning apparatus, but he thought it would be very difficult to wash afterwards. The sponge cloths were washed by a rotary washing machine, after the oil had been extracted from them. It was the oil-extracting process that he desired to bring before them as a new idea. He endorsed the reference by Mr. Ross, as to the immensity of the subject of waste utilization, and would say that there were thousands of articles manufactured, the waste material from which was now utilized.

In reply to Mr. McLaren he was informed that sponge cloths cost about 7*s.* 6*d.* a gross, or more according to size.

The manufacture of glycerine was a fairly well known process, but it would take too long for him to describe it meantime. In regard to the glycerine of which he was speaking, he might say that a plant was put up by a firm manufacturing explosives. Glycerine was a by-product of soap-making, and the plant to which he referred was erected for the manufacture of the glycerine, the soap being sold as a by-product. He did not think they could get coal that would evaporate even 6 lb. of water per lb., delivered in London at 8*s.* 6*d.* per ton. Mr. Hulme thought he had something new in a shirt tearing

machine, but it had been whispered to him that shirt tearing was not a new industrial pursuit. They had treated a lot of sheep cloths by the benzine process, taking out the grease, and those cloths did not need washing. They were greasy, but not black, but he dared say they could be easily treated if they were black as well as greasy. Those sheep cloths turned out all right. In conclusion, he desired to thank the members for giving him such a patient hearing.

Mr. J. Fleming proposed and Mr. J. H. Redman seconded that a vote of thanks be accorded Mr. Bertram for his paper.

Mr. Britton moved and Mr. G. W. Craigie seconded that a vote of thanks be accorded the Chairman for presiding.