

PAGES

MISSING



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Railway and
Engineering
Club ..
OF CANADA

OFFICIAL PROCEEDINGS

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PROCEEDINGS OF THE CENTRAL RAILWAY AND
ENGINEERING CLUB OF CANADA MEETING

Committee Room, Grand Union Hotel,
Toronto, March 24th, 1914.

The President, Mr. T. J. Walsh occupied the Chair.

Chairman,—

Gentlemen, if you will come to order we will commence the business of the meeting. The first order of business is the reading of minutes of the previous meeting. You have no doubt all had a copy of these, and it will be in order for some one to move that they be adopted as read.

Moved by Mr. G. Baldwin, seconded by Mr. Wright, that the minutes of the previous meeting be adopted as read. Carried.

Chairman,—

The next order of business is the remarks of the president. I have not much to say to you this evening, except that I am glad to see you all here, at this, the first meeting in the Grand Union Hotel. The quarters are ample, so far as I know at the present time, we seem to have plenty of room, and I hope you will be as agreeable and sociable as possible. The reason for making the change was that it was thought we would be more sociable here, as the room at the Temple Building was a trifle large for us, and we were a little out of place. I sincerely trust you will all be satisfied with the change.

I shall now call on the secretary to read the list of new members.

NEW MEMBERS.

Mr. H. Fair, Machinist, Roundhouse, G.T.R., Palmerston, Ont.

Mr. A. F. Beetlestone, Boilermaker, Roundhouse, G.T.R., Palmerston, Ont.

Mr. Edward G. Mack, Managing Director, Crouse-Hinds Company of Canada, Limited, Toronto.

Mr. Robt. Law, Boiler Inspector, Canadian Casualty & Boiler Insurance Company, Toronto.

- Mr. W. G. Blackgrove, Boiler Inspector, Toronto.
 Mr. W. E. Wigginton, Foreman, Bridge Dept., Canada Foundry Co., Toronto.
 Mr. W. J. Fee, Road Foreman, G.T.R., Lindsay, Ont.
 Mr. E. F. W. Salisbury, Electrical Engineer, Toronto.
 Mr. H. R. Smith, High Level Pumping Station, Toronto.
 Mr. Wm. Mitchell, Machinist Consumers' Gas Works, Toronto.
 Mr. A. E. Price, Stationary Engineer, Board of Education, Toronto.
 Mr. W. J. Perry, Superintendent Plant Maintenance, Toronto.

Chairman,—

Any reports from standing committees? Nil.

Any unfinished business? Nil.

Reports of Special Committees. Nil.

MEMBERS PRESENT.

Chas. Russell	J. D. Fraser	Jas. Wright
Jas. Kelley	A. M. Wickens	H. C. Austen
Geo. Baldwin	A. M. Smith	W. Wighton
Hugh Lamont	J. H. Dunsmore	F. J. Ross
J. M. Clements	D. Campbell	Jno. Egan
Geo. Smith	Jno. Dennis	Jas. Herriot
J. B. Robb	W. H. Robb	R. Rutherford
Fred. G. Smith	W. Sharp	Hugh Paton
Geo. H. Boyd	T. B. Cole	W. J. Perry
C. H. Stainton	H. R. Smith	J. Barker
A. R. Taylor	F. Smith	A. E. Till
C. D. Scott	J. Murray	A. T. Voehl
A. E. Price	W. C. Sealy	J. Anderson
J. W. McLintock	A. J. Lewkowicz	T. J. Walsh

Chairman,—

The next order of business is the reading of paper and the discussion thereof. We have with us this evening Mr. H. Westbrook, Battle Creek, Mich. who will read a paper on Shop Efficiency. I shall now call on Mr. Westbrook.

"SHOP EFFICIENCY"

By Mr. H. Westbrook, Foreman, G.T.Ry. Shops, Battle Creek, Mich.

I think I ought to feel somewhat of a stranger among you to-night, but for some reason I have never felt that way in Toronto. I can still remember landing here from the Old Country well nigh forty years ago, and it certainly seemed strange to me then, coming out here in this new country. I have a warm spot in my heart for Toronto, especially Toronto ladies; I might just tell you an incident which occurred when we were living here, and I was a little nipper.

My father at that time was employed as chief engineer at the Hesson Biscuit Works, which was then on Front Street; I don't suppose this is in existence at the present time; we lived away up on a street called Terauley. There were, of course, no telephones at that time, and frequently when my father had to work nights, he would get the delivery man to tell my mother he would not be home for supper, and I would then have to take him down some lunch.

One night I was taking him some poached eggs on toast and I well remember as I was coming down Yonge Street, which was paved with flag-stones then, and rather uneven, my foot caught on one of these, and over I went, the lid came off the dinner pail, poached eggs, toast and everything else went all over the sidewalk. Of course, everyone stopped and were laughing at my predicament, and I was pretty near crying when some dear, kind, old lady put her head out of the window up above one of the stores, and said, bring up your pail, little boy. Well, I seemed to have an idea she was going to do something for me, and so I went up. When I got up there she told me to never mind and not worry she would soon help me out of this mess. She had the maid make some tea, and got a leg of lamb and cut several slices off it, making some very nice sandwiches. She wiped off the dinner pail, and arranged everything nicely, and started me off down to my father. When I got there, of course, he wanted to know where I had been and what kept me so late, and I told him I had got there as soon as I could, that I had been stalled in the crowd.

I was in bed when he got home that night, and mother also. Instead of going right to bed, however, he went to the pantry and was searching around there. Mother called and asked him what he wanted, and he said,—“Oh! I was just looking for some more of that lamb I had for supper.” “The lamb,” she

said, "Why you didn't have any lamb for supper; you had poached eggs and toast." "Do you mean to tell me that I don't know the difference between poached eggs and lamb?" said he. "Well, I know that you had poached eggs anyhow," and they were arguing away for some time, when I remember mother came in to my room, but not wishing to have to explain she didn't succeed in awakening me and to this day they don't know the explanation. That is the reason I have such a warm spot in my heart for Toronto ladies. And if I were to come across any of that woman's descendants and they were in unfortunate circumstances I would be willing to share my last meal to help them out. I have mentioned this, so that we will not feel such strangers here to-night.

I will now read my paper, and hope that I will profit by the reading of it, and the discussion thereof, just as much as any here who listens to it.

I have been requested by the committee in charge of your monthly papers to read before your club, a paper on "Shop Efficiency." In complying with this request, please bear in mind that I am not posing as an efficiency engineer, business expert, industrial doctor, or any other similarly titled expert, but as a shop foreman interested in obtaining the greatest degree of efficiency and in not overlooking the small inefficiencies which occur every hour of the day in every shop. We will endeavor, therefore, to confine ourselves to those things which any foreman can accomplish with his own organization and without the expenditure of a large sum of money or the calling together of the board of directors to sanction some new policy. A number of our suggestions are, no doubt, painfully obvious to many here this evening, but I can assure you there are still many shops where some of them can be employed with profit. Promising not to deal with the over-worked subject of scientific management, we will discuss some efficiencies and inefficiencies that may be daily noticed.

WHAT DOES EFFICIENCY MEAN?

Efficiency means keen self-criticism, it means going into your shop and finding nothing there which is sacred or fixed, it means that methods employed six months ago may to-day be ancient history, it means forgetting traditions and the questioning of everything including yourself, your methods and your knowledge. It means to make the work easy by doing away with unnecessary motions thereby enabling a workman to employ all his time in doing productive work and not tiring himself performing labor, not actually required or that can be equally as well or better performed by other means.

True efficiency is more interested in the study of the man than of the machine. Required to produce certain results,

and given a choice between a factory equipped with modern tools, up-to-date appliances and a staff of disinterested men, or with an out-of-date equipment and a staff of good, loyal men, ready to co-operate and show what could result from such a combination, I would most certainly choose the latter. But given the loyal men, the up-to-date equipment, and men directing things who could and would create and keep this attitude alive, then we would obtain the greatest efficiency.

The first requisite, then, for greatest efficiency, is to create a condition among your men where each one is as anxious as yourself to reduce to a minimum all unnecessary work, to be more willing to call attention to improvements than to have them pointed out to them. This is not an impossible condition, or even difficult to attain. I have in mind one shop, a piece work one at that, where men are frequently suggesting that, if their particular job was to have the pattern slightly altered, or a certain tool or device supplied, they could do the job for 10 or 20 per cent. less. To have such a condition there must exist the greatest confidence between the foreman or superintendent and the men. We must get it into our heads that it is only possible to obtain the greatest degree of efficiency where you have the greatest degree of co-operation. If the employer feels that greater efficiency is only a method by which he makes his workmen exert themselves very much more, entirely to the employer's gain, he had better stick to his present methods whatever they may be.

FOREMEN AND MECHANICS MAY LEARN FROM EACH OTHER

The foreman should understand that the fact of his being foreman does not imply that he knows all there is to be known about everything that he is supposed to be boss of or supervisor over. He must not think or permit his men to believe that he thinks he has no more to learn. On the other hand, the machinist, blacksmith, carpenter, etc., must not be permitted to think that, because he is such, he knows everything there is to know concerning his branch of the trade, so I say again, the man most closely in touch with the directing of his men is the one to whom we must look to obtain the foregoing desirable results and the more successful he is in this, the more real value he is to his employer, and the better prepared he will be for advancement should it come to him.

I became more interested in this subject than I had hitherto been, although for years I had gradually found myself being more and more attracted to it, on receiving a letter from a friend of mine, who at that time was superintendent of a large machine shop in another city, who had known that I was interested in the subject. For reference, I quote the following part of his letter:

"Things are so busy in the shop, I must either ask for more mechanics, more machines, work overtime, or "go after" my men harder. Now, while I am sure they are just as fast a bunch, if not faster than the average, my speeds and feeds up to the limit of high speed steel, and they are loyal to me, and I do not wish to recommend engaging an 'Efficiency Expert,' can you arrange to come over and visit me and knock around the shop for a week or two; I believe you could see things that I may have overlooked in my familiarity with them. Don't disturb things in the shop, but keep your eyes open, and ask questions, make notes, and we will talk it over at the end of the week. If you see room for improvement, just tell me where, and don't spare my feelings in the least. Let me know when to expect you.

"(Signed) Bob."

Being in a position at that time to take a vacation, I did as Bob suggested, and trusting I may be pardoned for my apparent egotism in describing the conditions found there, and suggesting to those here who are desirous of making improvements in their own shops to arrange for a similar exchange of visits with friends in the same line of work. Imagine for the time of the visit; that you are a highly paid expert procured to make a report of conditions as they appear to you, not sparing your friend's feelings at all, and as these reports need not be seen by others than yourselves, they can do you no harm in the estimation of your employers, and the experience will be of great value to you both.

My first impression of the shop in question were that his estimate of conditions was correct. His speeds and feeds were as described, his men above the average in ability and willingness, the machinery well kept up, and apparently everything possible was being done. But, continuing the investigation, it was noticed that when a belt broke, the operator repaired it himself, wire lacing being kept in the tool-room for the purpose. The practice resulted in a general run-down condition of the belts, each man having his own idea of what was the proper way to repair a belt, and apparently having his own opinion of the proper time it should take to lace a belt. Some very poor specimens of belt lacing were found throughout the plant. One particular belt took eighteen minutes to get into service again. A special belt-repair man can repair a 4 inch belt in less than four minutes, and I would recommend that a special man be appointed for this work who would care for, lace, and watch all belting, working during the noon hours inspecting belts overhead, and not waiting until they break before being repaired. This man should also inspect all split pulleys and counters during cessation, see that there are no

indications of nuts, etc. becoming loose, dividing the shop into sections and going over each one in its turn, dressing the overhead belts with a good reliable dressing when found necessary. A sticky substance should never under any circumstances, be placed on a belt, but a dressing that goes into the belt, put on both sides so that it will lubricate the fibres more quickly. Place in his hands some belt literature and see that he is intelligent enough to understand it by questioning him occasionally on the subject dealt with, and also see that he knows just what every foot of each size belting is worth. When he knows that a piece of 3 inch belting 3 inches long costs ten cents, his efficiency will be much greater than before he was so instructed.

It has been stated, by reliable authority, that it requires fifty per cent. more horse-power to operate a plant or shop equipment of tight belts than it does when they are in good condition and running slack. In shops where belting receives but little attention, the upkeep of countershafts, motor and other bearings, machinery, etc., is a matter not to be treated lightly, but as we could profitably devote a whole paper to the consideration of the care and upkeep of belting and countershafts, we will not dwell longer upon it here.

HIGH SPEED STEEL

While plenty of high speed tools were in use throughout the shop, no high speed drills were being used for the reason that they had such a large supply of carbon drills on hand. I advised Bob to procure a 1 inch high speed drill of a certain make, and we would make a demonstration next day, which we did with the following results:

The best results with the carbon drill were obtained at a speed of 35 feet peripheral speed per minute, and feed 0.018 per revolution, and the drills required grinding every ten holes. With the high speed drill on the same class of work, we ran 90 feed per minute, feed 0.0250, drilled 53 holes without grinding. On reducing feed to 0.018 several hundred holes were drilled without changing drills.

LATHE WORK BEING DONE ON DRILL PRESSES

Work was being performed on lathes with boring bars and threading tools by high-priced labour, that could have been done equally as well and at much less cost, and in some cases in one half the time, on drill presses by the use of special cutters and taps, the only changes being necessary was altering the patterns so that instead of coring the holes almost the proper size which resulted frequently in the lathe hand being obliged to cut on the scale, they were left solid, the high speed drills

and special cutters making much better time cutting from the solid than the lathe hand could possibly do by his methods. This condition seems to exist wherever I have had occasion to visit machine shops, and is well worthy of consideration.

NON-PRODUCTIVE PERIODS OF MACHINES

When a change of jobs was to be made on the planers and boring mills particularly, much loss of time resulted in the operator either waiting for the travelling crane which was usually working elsewhere when wanted, or if at hand, the operator alone unloading or reloading his machine, cleaning cuttings out of bolt slots, bolting down and setting the new job himself, when a sufficient amount of help should be available to do the necessary unskilled part of the work, thereby getting the full benefit of a skilled man's services with the least possible amount of delay. He is only earning a mechanic's pay while doing work requiring a mechanic's skill.

This feature alone, of neglecting to obtain the most of a skilled man's time by allowing him to perform much labor that should be performed by helpers, is a most common form of shop inefficiency, and Bob saw the force of it when the number of hours lost by machines and mechanics while changing jobs was shown him. It is the idle hours of the machines, the non-productive minutes of each, which soon reach an appalling amount, if not carefully watched. Each machine depending on the travelling crane should be equipped with an individual crane and hoist, either electric, pneumatic or differential chain. These cranes are of so simple a form that they can be designed and built in an ordinary machine shop, and will pay for themselves in a short time.

When we consider that, if the travelling crane had but two machines to serve, there would arise occasions when one machine would be obliged to wait while the other was being attended to, then how much more delay occurs where forty or more are to be served. The lack of means, independent of the travelling crane for loading and unloading machines, is another all too common and neglected form of shop inefficiency.

TOOL GRINDING

Each man was doing his own tool-grinding, Bob stating that he did not wish to stir up any discontent among them by having, as he termed it, some "Dub" do the grinding for good machinists. Now here is where some will take issue with Bob and say he should have put in a tool grinding system if he thought well of it, whether the men liked it or not, that he was running the shop, etc. But it must be borne in mind, however, that the business was paying well. His employers

were not complaining on that score, but were well pleased with the results, under the circumstances, having surrounded himself with a number of excellent mechanics, so can we blame him for not wishing to deliberately create any discontent.

As many of the men were on special work, each one having his own idea regarding the best form and shape of tools most suited to produce the best results, we decided, instead of installing all at once, a general tool grinding system, to have a pattern maker construct exact models in wood of each kind of tool that had proved most satisfactory, consulting with the men themselves who had developed them as to details. This immediately got them interested as their ability was thus recognized. The tool-smith then forged some of each shape, and a special man was appointed to grind them to the correct forms and keep them in the tool room, to be taken out as wanted, being called for by number, which was shown on framed blue-prints having reference to the class of work they were for. The men, seeing that these were their own design of tools that were being kept up, and soon learning that operating a machine was easier work than grinding rough forged tools, fell in with the idea, and I have since learned that the system now extends over the whole shop, having the hearty support of all the men. This was accomplished in a few months, with the co-operation of all, what, if attempted all at once, would have created discord and other undesirable conditions.

OIL DISTRIBUTION

Considerable loss of time was noted, owing to each man going to the store room for small squirt cans of oil when required, occasionally some six or eight standing at the wicket at a time. This was another instance of the skilled man doing the unskilled man's work. One of the labourers was given charge of the oil distribution each morning going the round of the shop with a large can and filling all small cans that were left in a given place on machine or bench. No conversation with the men was necessary, and he now serves those of one hundred and fifty users who require it, in three-quarters of an hour each day. He is also supplied with a record book, so that a tab is kept of the amount of oil being used daily, and should the amount appear too large at times, an enquiry can be made at once.

We will now close with Bob's shop, as I am not going to say what the result of correcting the inefficiencies we found was in actual output, but no overtime was worked, only one machine was purchased, and the men were not chased any harder; and locating these inefficiencies was done in such a manner, that instead of the men being lead to believe they were going to be shown up, instructed how to run their machines or made to

work harder, they were induced to co-operate, most of the men taking pride in offering suggestions with a view to increasing the efficiency of the shop, which spirit, I am told, still continues a evidence there.

PNEUMATIC TOOLS

The care of pneumatic motors is often neglected to the extent of amounting to a very glaring inefficiency, and to quote Mr. Kingman's remarks in "Ideal Power" who says, that after his locomotive has run 150 miles, a trained engineer proceeds to feel all the rod connections, and see that they have had oil, seeing that all nuts and bolts are perfectly tight, etc., though a locomotive in that time has only made about 30,000 revolutions. Now, a pneumatic drill is some machine, when compared to a ponderous locomotive, and, in the hands of the most inexperienced help will, when used on drilling staybolt holes in this big locomotive's boiler, exceed 1,000,000 revolutions in a day of ten hours. When a locomotive makes a million turns, it would have run 3,300 miles, and spent about two weeks doing it, and about half the time in the round-house receiving expert care and attention. The pneumatic drill is as fine an engine as any other type, and why not give it a little of the care that railroads are expected to give their locomotives, it would amply repay us in service.

I have seen many of the varieties of care these air tools receive, thrown from the front end of a locomotive on to the floor, hammered to release the drills, run without lubricant of any kind for days at a time, this treatment mostly occurring when they are placed in the hands of unskilled labour, as the nature of the work these little engines can accomplish is such that the most unskilful employes can with them successfully perform the work required.

We must face these conditions, and I would suggest that the best way to overcome the misuse of these tools is to have the operator go into the tool room when a motor is being taken apart, and receive instructions as to the need of frequent oiling, and be shown the light construction of the cylinder walls, explaining that they were purposely made light for their well-fare, so that they would not have the heavy weight to constantly handle, were they constructed so as to withstand rough usage. They also should be shown, while the cover is removed, the speed the inner works revolve at.

I have demonstrated, to my own satisfaction at least, that they will then have a much greater regard for these wonderful little engines and the repairs found necessary will soon be those only due to regular wear and tear, which should be performed regularly each week, the motor being examined, adjusted and oiled, even if repairs are not necessary.

SAFETY

The Safety movement is now becoming nation-wide, and is recognized as an important factor of shop efficiency, but until quite recently, I think there has been no more neglected feature of shop efficiency than the consideration of such rules of safety as would insure the minimum amount of time lost through accidents.

I will remember the words of one superintendent I worked for in Canada who, in addressing the employees after an unusual frequency of casualties occurring in the works, said: "While you men have a perfect right to injure yourselves if you wish you have no right to impair the efficiency of these works in doing so, for it is not only the loss attendant upon your own personal injury with your enforced absence from your work, but one serious accident in a plant affects the efficiency of the whole organization."

While this seems to be somewhat of a heartless argument to advance as a reason for not getting hurt, still we must admit that his contention is correct.

Many shops having covered up the most noticeably dangerous parts of machinery, posting up a few notices warning employees to be careful and take no risks, have been content to let that be the extent of their interests in the safety of the employees; each man having his own standard of what due care was, frequently resulted in personal injury, entirely due to his own interpretation of carefulness. Specific instructions should be given and rigidly enforced, and their enforcement is strictly up to the foremen, who in this respect, must be firm. It is my own experience and that of many others with whom I have discussed this subject, that the men will sooner than you might imagine, detect any laxity on his part and are generally inclined not to display one whit more cautiousness than the foreman insists upon.

Some suggested instructions are herewith submitted:—

Do not shift a cone belt by hand. Tell them here how you wish it done.

Do not allow gloves to be worn around machinery of any kind.

Do not allow any cleaning up of machinery in motion while using waste or rags.

Do not permit a workman to wear loose or torn sleeves while operating any revolving machines.

Do not permit anyone to work at emery wheel without goggles.

See that the man who oils up countershafting is instructed not to touch it until the operator has hold of the shifter rod below him. (I know of a very serious injury occurring to the

oiler above, owing to the operator suddenly putting his belt over, he not knowing that the oiler had his hand on the loose pulley).

Forbid any man using air motors that have not perfectly air-tight and reliable throttles, not easily started.

Many other positive instructions suitable to local conditions could be added.

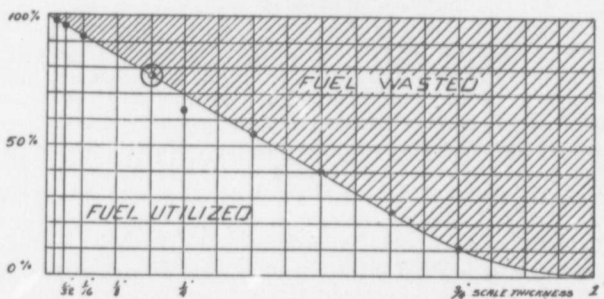
The care of lifting chains should also be in charge of some responsible man who should see that they are regularly annealed about three times per year if in continual service. Should it be found necessary to replace a link, see that the new one is of the same diameter as the others. Carelessness here on the part of the blacksmith has been known to creep in. The man who hooks on should be thoroughly acquainted with the safe loads chains will carry, and should be familiar with the weight of all the heavier lifts, and instructed, if in doubt, not to lift until he finds out from someone in authority. A framed blue-print of safe loads for the various size chains should be posted in a conspicuous place in the shop. In spite of all this precaution and care, accidents will occasionally occur, in which case a form should be filled in immediately. Should it be found that the victim, on account of the nature of the accident, had to receive medical attention, this form should describe how the accident happened, how the person injured thought it could have been avoided, also how one or more of the witnesses thought it might have been prevented. Should it be an injury of the eye, state if goggles were worn, and if not, explain why. In short, train the men to feel that they must be as anxious to prevent casualties as you are. Endeavour to enlist their interests to the extent that they will feel it a reflection upon themselves as much as upon the foreman, should a preventable accident occur. It may be well, where accidents are not infrequent, to have a shop safety committee investigate them, and post a bulletin containing the result of their investigations and recommendations. These and other practical directions strictly adhered to by all concerned will soon produce such results that a real preventable accident will be of rare occurrence.

CARE OF BOILERS

While not in a position to say a great deal on this important subject, the chart displayed may prove of some interest. This was drawn from the data obtained by an inspection of ten boilers made by an efficient boiler inspector for a certain well-known company, and well illustrates that much room for more efficiency in the boiler room still exists.

It is a well-known fact that the efficiency of coal in generating steam varies from 10 per cent. to 14 per cent. This

efficiency is lessened considerably by allowing coatings of scale to accumulate in the boiler tubes, the figure at the top of the paper illustrates a water tube on which the scale has become about three-quarters of an inch, and estimated by engineers to be a barrier to heat one hundred times more effective than the same thickness of steel. This insulation means big fuel losses, and the intense heat necessary to penetrate it is bound to render the boiler tubes brittle and weak.



HOW IT WASTES FUEL—QUICKLY DROPS THE CURVE OF EFFICIENCY WITH EVEN SMALL SCALE COATINGS QUICKLY THE BOILER LOSES ITS POWER TO MAKE STEAM FROM BURNING COAL. THE POINT ON THE CURVE, MARKED BY THE LARGE CIRCLE, REPRESENTS THE AVERAGE THICKNESS OF SCALE AS REPORTED BY INSPECTORS OF FACTORY POWER PLANTS A LOSS OF 28%

The chart shows the gradual decreases in the available heat used to generate steam. The horizontal lines represent the percentage of available heat wasted in proportion to the thickness of scale as represented by the vertical lines.

The ten boilers inspected are represented by the dots on the efficiency curve. Thus, with 1-32 inch scale, the curve drops about 4 per cent., leaving 96 per cent. efficiency; 1-16 inch scale leaves 91 per cent.; 1-8 inch scale leaves 84 per cent., etc.

The efficiency curve drops quickly, even with a small amount of scale. The point on the curve marked by the large circle

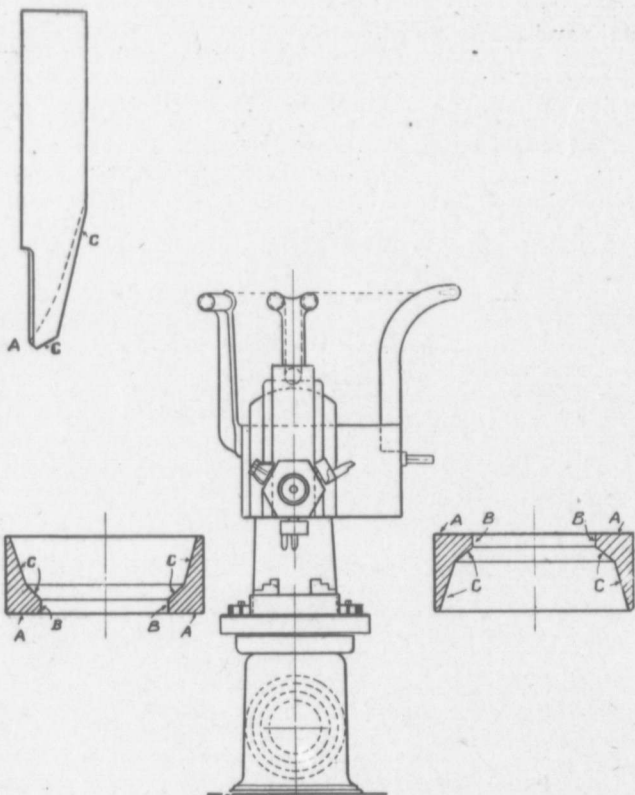
represents the average thickness of scale, a loss of 28 per cent. of the available heat used.

However, as the inefficiency of the power-house is a question to which we could devote a whole evening, I will not attempt to deal any further with it at this time.

THE NEW MAN

Another important shop problem effecting its efficiency and the last one I will deal with to-night, is that of the "New Man." It is fair to assume that you need the new man quite as much as he needs the job, but too often he is discouraged the first morning by the manner in which he is introduced to his new job, which frequently is about as follows:

A small boy from the office escorts him through many devious ways, past whirring machinery, among strange and perhaps unfriendly faces, to a busy foreman, with a note instructing him to start this man as a lathe hand, we will say. This foreman, who perhaps is, unintentionally, out of sorts that morning, gives him a cold look and takes him to a lathe, shows him the material to be worked up, hands him a blueprint, telling him to whale in and that the job is in a hurry. This sort of an introduction is enough to discourage the average man at the start, and do not be surprised if your new man will, within a few hours come up, tap you on the shoulder and ask you for his time, especially if work happens to be plentiful elsewhere, in which case you need his services all the more yourself. Now I hold that it is just as essential that a foreman be competent to fulfil efficiently that part of his duty which calls for getting the new man properly started as in getting the new machine properly installed, and quite frequently it is just as necessary. The new man should be received cordially, questioned in a friendly manner, to ascertain what he is most accustomed to work at, and learn what class of work he considers himself most competent to perform. Make a note of this information for future reference, as it will be of value when certain vacancies later occur, then explain to him just how the work should be handled. Should he be placed on a class of work for which it has been practical to make an operation sheet, hand him one, similar to the one presented herewith, which is merely to illustrate the idea. You will note that from a series of motion studies taken previously, each operation is numbered, shapes of tools decided upon as being the best so far discovered, feeds and speeds that have been found the most effective, printed plainly. The man, on starting, should be told that the sheets describe the best method that so far has been evolved for performing that work, and that if after acquainting himself with it thoroughly, he can improve upon it in any way by making any change, that you will be pleased to consider it, advising



him that you are looking for the class of men who can improve upon existing methods. You thus succeed, as it were, in challenging the new man to do even better than his predecessor, and have made him feel that he has an opportunity here. He does not have to approach a new and strange job with nothing to guide him. His standard practice card tells him just how his predecessor went about it, how long he took to arrange his tools or fasten his chuck, which part to machine first, and why, styles of tools he used and total time it took to complete the job. Should he find himself falling behind he can, without asking questions, ascertain just where he is losing out. The time of these operations should not be the best that is possible to obtain under the most exceptionally favourable conditions, but should be based on the time taken to do a

STANDARD PRACTICE SHEET										
SETTING NUMBER	OPERATION NUMBER	OPERATION	SURFACE MARKED	DEPTH OF CUT	FEED PER REVOLUTION	FEET PER MINUTE	TIME		ACTUAL	REQUIRED
							MIN	SEC		
	'1	CLAMP UNIVERSAL CHUCK ON TABLE					5			
	'2	TOOL TURRET					8			
1	'3	FACE OFF AND CHAMFER BOTTOM OF CUP	A	$\frac{1}{16}$	$\frac{1}{20}$	55	1			
2	'4	WITH FACE A OF TOOL BORE DIAMETER 'B OF CUP	B		HAND FEED			6		
	'5	WITH FACE C OF TOOL ROUGH BORE	C			40	3			
	'6	REAM COMPLETE	B C				1	30		
TOTAL TIME PER CUP							5	36		

number, to which has been added the necessary time taken for grinding tools and personal needs. Make the sheet a fair and straightforward one, and your new men will soon get to appreciate the value of it to themselves as well as to the efficiency of your shop.

I would call attention to the steps taken in securing a motion study which has been extensively adopted.

1. Make time study of motions as at present.
2. From the time study ascertain the proportion of idle time and amount of productive to non-productive motions.
3. Determine present motions that are unnecessary.
4. Study each motion separately and its relation to the preceding and succeeding one to determine the easiest and quickest manner in which each may be performed.
5. Group motions into unit operations.
6. Assemble unit operations in proper sequence.
7. Re-establish total time for one complete cycle.

From this data you may then construct your shop standard practice cards, making the allowances I have already spoken

of. So many operation sheets are treated with deserved ridicule by the men, owing to the assumption that a machine can be operated all day long at the same rate, that one single piece can be machined under the most favourable conditions of newly ground tools, and no allowance made for distorted, hard or bad castings.

While looking at this standard practice card, attention is called to the advantage of the extended use of various size chucks fastened to the regular tables of boring mills over the method of attempting to do all classes of work on the one large chuck or four independent jaws usually furnished with these machines.

And now I find, that while I have fully occupied the time allotted for the paper I have left untouched many forms of shop efficiency that we could profitably discuss, but, if I have succeeded in showing that, after all, shop efficiency is not so much a matter of modern machinery, not so much strict discipline, and not so much complex organization, although these are all very desirable, as the thorough understanding of men, I shall feel repaid for having had the temerity to appear to-night before such a distinguished body as the Central Railway and Engineering Club of Canada.

Chairman,—

Any person who has been in a Machine Shop any length of time cannot help but profit by a paper of this kind. I am a machinist myself, having served my apprenticeship of seven years in the Northern Railway Shops. I started when I was twelve and was through when I was nineteen. They do not do that now.

I was just thinking how much the methods have changed since then, and shop efficiency has been got down to a science. We started right at the bottom which was on a bolt-making machine and were transferred from one machine to another until we finally got to the large lathe where they turn locomotive driving tires, which was then conceded to be the best machine in the shop, but it is now considered a very common job, as compared with working on some of the other machines.

There were very excellent points brought out in Mr. Westbrook's paper in regard to quelling discontent among the men.

Every new machine that comes into a shop nowadays when seen by the men they say, why that machine is going to do twice as much work as the old one; some one is going to lose his job. But seldom does any one have to go, as the employer who wishes to get good results, always has room for the skilled mechanic.

I would just like to say a few words in regard to scale on

the boilers, which was one of the points brought out in Mr. Westbrook's paper. Some time ago the new management complained of the amount of expenditure for a certain boiler compound we had been using in the boilers at the Pumping Station, and they wanted me to try something else less expensive. I was requested to try phosphate of soda. I had used it before but never with very good results. The next time the boilers were inspected we found so much scale on the tubes that it was necessary to purchase one of those rattlers to remove the scale, and in the end it was just as expensive as using a more costly boiler compound.

After this I tried an expensive boiler compound again and when the boiler was opened yesterday it was found to be almost perfectly clean and free from scale, which goes to show that efficiency is a saving in the long run of both time and money.

No doubt some one would like to ask Mr. Westbrook some questions, and he will be only too pleased to answer them. I will call upon Mr. Wickens.

Mr. A. M. Wickens:—

I was certainly very much pleased with Mr. Westbrook's paper. He has got the idea of system down to a remarkable degree. I am like Mr. Walsh, our president, I am a back number as a machinist, having served my time way back in the 60's in a shop where at that time there were about fifty employees and now there are 540. In this shop there is a very excellent and efficient system which I believe is directly the result of some strict yet excellent rules which were in force at the time I worked there.

There is no man but who can practice this efficiency in his shop, no matter what kind it is, and if your shop is run on a systematic basis with well-satisfied men, you cannot help but get good results.

There are of course some points brought out in this paper which apply particularly to the large machine shop but the majority of them are applicable to any kind of a shop.

A very good point was brought out in regard to starting the new man right, but of course it must be understood to do this and also to keep the men contented the foreman must have a certain amount of knowledge of human nature.

For the last few years I have been connected with boiler work principally, which was touched upon during this paper. There is no question but that the boiler in the average plant is not looked after as carefully as it should be; the average owner of a plant looks upon the boiler as a necessary evil. The position which the boiler holds in a plant is a very important one. If the boiler stops the whole plant stops. Very

few manufacturers realize that more money can be wasted in the boiler room than in any other part of the shop. With poor conditions 45% of the boiler's efficiency can be wasted. Under the most favorable conditions only about 68% of the heating value of the fuel can be utilized, and with an indifferent man in charge of the boiler and the same in a dirty condition the percentage is greatly diminished, sometimes it is as low as 25%. In cases where the belts and pulleys are not kept in good condition and the plant is in a general run-down condition it is only possible to utilize about 6% of the heating value of the coal in actual delivery in power at the machine which goes to show the saving that good efficiency will effect. If you follow this paper right through from top to bottom, to my mind you will find it such a thorough one along these lines that it does not leave much scope for questioning.

Mr. J. Herriot,—

I would like to ask Mr. Westbrook, in his course of study, along what lines has he found this efficiency most applicable to the Stores Department of a plant. The speaker touched upon the question of time lost through mechanics going for tools, etc.; take the small bolts, split pins, cotters, etc., are they treated in the same way.

Mr. Westbrook,—

I don't think I have paid a great deal of attention to the question of efficiency of the General Stores Department.

One point, however, is this, as a rule I find that the storeman whose duty it is to hand out material to shopmen on receipt of the yellow slip does not know the value of the different articles which he is continually handling. I have been in a number of shops, but never could I find out from this man the cost of the articles. The chief storekeeper, of course, can always tell me, but I think if the man who supplies the material to the shopmen knew the value of same, he would be more liable to effect the saving that it is possible for him to make through economy.

Mr. Herriot,—

I agree with the speaker there; I think that is a very good point. As a rule in the majority of stores the bookkeeping end of the work is carried on by a separate set of clerks, and they are therefore the ones who are in a position to learn the prices of material. The same point is of course applicable to the shop men. When they drop a cotter pin on the floor they will generally take a new one up and let the old one go, thinking

it is only a small invaluable article, whereas if they knew the value of same they would realize what a waste it is.

The point I was getting at is this—are the men going from the shop to the stores for small articles such as split pins, cotters, etc., or is a small supply of these kept near them all the time. I have in mind a system, and probably Mr. Westbrook has also seen the same system, in large manufacturing plants, where a certain section of the floor space near the erectors is railed off and reserved for "finished parts and material," which will be called for when erecting.

In this store, or near same, is kept all the finished castings and parts as they leave the machines; there is also delivered to this store the necessary quantity of bolts, nuts, cotters and small parts, (usually carried in general stores) which will be used in completing the finished machine. These are charged directly to the job, when issued to this store.

By this system the erector has all the parts close to his hand, and it is not necessary to have a mechanic leaving his work to go to the general stores every time some small article is required. Should there be anything left after the order is completed, the article is returned to general stores and order credited for same.

Mr. Wallace H. Robb,—

I would just like to supplement Mr. Westbrook's paper with a few remarks relative to the salesman's side of the efficiency question. I have not anything to say to you about my present methods, but I have in mind a gentleman who is a considerably older hand at that business than I am, and who is considered quite a successful salesman.

One time there was a question came up in his house of some hinges and an electrolier that required attention, and his wife had spoken to him about same and asked him to fix them, but he told her to get a mechanic to do it.

She mentioned this to me when I was visiting them one day, in a sort of a bantering way, about what a poor hand he was at looking after mechanical things in his own house. "Well," he turned to me and said, "I have always considered that my time is more valuable to me outside selling my goods and talking to my customers than being at home doing the work of a mechanic."

This merely supplements Mr. Westbrook's remarks about the mechanic doing the work of a labourer and serves to point out that in some cases it costs less in the long run to get a man to do a job for you than to do it yourself.

Mr. Wickens,—

I think that this one of the greatest mistakes made by manufacturers with large shops. It reminds me of the time my wife was after me to saw some firewood for her. "Why!" I said "I can earn enough money in three hours to pay a man to saw wood all day here." I think this is the very strong point brought out in this paper.

Chairman,—

This is no doubt very true. I don't believe, however, in employing a labourer and putting him at work of a mechanic either. There are employers who like to pick up a man to do a job as cheaply as they can. They pick up a man off the street and put him on a lathe in a few days. I never did think it was fair to engage too much of this class of help. A man that serves his time, and gets to be a thorough mechanic, wants to get something out of it, and practice all branches of his trade. Some employers will always try to get the work done as cheaply as possible. I think there should always be a medium between. The labourer should be used to do labouring work, and the skilled mechanic work requiring the knowledge of his trade.

I think that the hearty thanks of the members are due to Mr. Westbrook for the most excellent paper which he has taken so much time to prepare and read before us this evening.

Mr. Jno. Dennis,—

Mr. President, I move that we extend a very hearty vote of thanks to Mr. Westbrook for the excellent paper which he has read before the club this evening.

Mr. G. Baldwin,—

I have much pleasure in seconding that motion. While I was sitting there listening to Mr. Westbrook I imagined I had seen him before somewhere; I don't know whether it was the time he spilled his father's poached eggs on the sidewalk, or when he was jumping over the flagstones on Yonge Street. I had a letter from Mr. Garden introducing Mr. Westbrook to me, and although I haven't yet been speaking to the gentleman, I certainly intend to, as Mr. Garden states he is like myself an amateur horticulturist.

Chairman,—

It has been regularly moved and seconded that a hearty vote of thanks be extended to Mr. Westbrook. All in favour please signify in the usual manner. (Applause)

Mr. Westbrook,—

I thank you, Mr. President, and members of the Central Railway and Engineering Club of Canada. I would like to say that this club is thought very well of up West where I am at Battle Creek. The little green books are expected monthly and perused very thoroughly. What pleased us very much was the paper on "Horticulture." It was very good to see that engineering men can go so far out of their sphere and have such a thorough paper along the lines of a hobby.

There is one subject, however, which you have never yet had a paper on, and which I should be willing to come all the way from Battle Creek to hear read, and discuss—that is the Diesel engine. I don't think there is any doubt but that this is going to play a great and important part in the future of the engineering world.

Chairman,—

I might say that at the next meeting April 28th, we will have a paper on somewhat different lines to anything we have ever had before. Mr. Fred. G. Smith, Chief Draughtsman, Canadian Allis-Chalmers, Limited, Toronto, will read a paper on "Steel Railway Bridges."

Mr. C. H. Stainton,—

I should like to say a word in regard to the subjects which have been discussed before this club. The paper to which we have been listening, is just as applicable to other branches of trade, and particularly the building trade in its several branches, and I should like very much if a paper could be read on "Carpentry and Plumbing," as they are the most important work about a modern house whether occupied by a mechanic or a millionaire. I have been a member for about three years and there has never yet been a paper on the subject of Building Construction, which I am sure some of the members must be interested in. I have had the opportunity of bringing several friends to the meetings, and have tried to induce them to become members but they say "Oh! they never have any papers along our line of work." I think there is a great deal to be said on the subject.

Chairman,—

We have had a number of offers for papers of late, one gentleman wishes to read two, on different subjects, and while it is not always possible to select papers that will be of interest to all, we are doing our best to accomplish this.

Mr. Fred. G. Smith,—

This being the first meeting in our new quarters I think the time is opportune to criticize the committee responsible for making the change. I think every one present is pleased with the change; the present room seems much cosier and more congenial than our previous one.

There is one thing I should like to see done at these meetings. I would like to see a platform about eight inches high set up for the speaker of the evening to stand on so that he can be seen all over the room. I purposely sat at the back of the hall to-night so that I could see the speaker plainly if possible, but all I could see was his head.

I move that a hearty vote of thanks be extended to the executive committee in consideration of the good judgment used in making the change.

Mr. C. Russell,—

I second that.—Carried.

Mr. G. Baldwin,—

As you are all aware it is the custom for this club to hold a picnic in May or June. Although the winter has scarcely left us, the fact still remains that spring and summer are coming and I have been informed that negotiations are already being made by the different societies for their picnics, and I think we should appoint a committee, to look into this matter and report at the next meeting.

Mr. J. Herriot,—

I second that.—Carried.

Mr. T. J. Walsh,—

I would suggest:—Messrs. Baldwin, Wickens, C. D. Scott, and Geo. Smith.

Moved by A. M. Wickens, seconded by J. Wright, that the meeting adjourn.