VICTORIAN INSTITUTE OF ENGINEERS:

DIESEL ENGINES—A WARNING.

By William Charles Rowe.

(Vice-President).

I understand that the title of my paper has given rise to some uneasiness, and I have been asked to reconsider it. I have been unable to see any need for alteration, considering the seriousness of the matter justified the title, however startling to those people who are for ever fearing damage to interests whether they be personal, professional, or vested.

The man of science, the skilled man, or the man in the street, possessed of knowledge of vital importance to the best interests of his fellowman when life and limb are at stake, is under obligation to the community to make such knowledge available, and indeed to spread that knowledge without consideration of vested or any other interests.

Fortunately I am not about to embroil this Institute, but to bring under notice a matter that I am confident this Institute, and all concerned in the best interests of the Diesel and similar engines will determine I have been fully justified in doing.

To the power engineer the Diesel engine has been, and is a subject of intense interest, and this interest is increasing by great strides. It is not the engine, its design nor ordinary operation with which I have to deal, but with what appears to be inexplicable want of appreciation of conditions of combustion by those most concerned in the matter under notice.

To enlighten those present who may not have had experience with the Diesel oil engine, it is necessary to explain that this, like all internal combustion engines, is not capable of self-starting from its own source of power, but it is provided with a means of self-starting from a supply of compressed air automatically stored by the engine after its first start. The supply of compressed air provided, permits of starting the engine under considerable load, the air supply being usually at 700 lbs. per square inch, and when the engine has attained sufficient speed the ordinary fuel supply mechanism is put into gear, and the ordinary cycle proceeds.

The operation of starting the engine from its supply of compressed air is simple and efficient, but to provide for false starts in the hands of inexperienced operators or for conditions requiring several essays at starting, the reservoir is of sufficient capacity to provide usually about six starting charges. Should by
any means these starting charges become exhausted it is the practice to keep in reserve a cylinder or two of compressed air, and in emergency this cylinder would be connected up and utilized for starting.

Amongst my notes of matters of interest in regard to the Diesel engine gathered from time to time, I came across an item which gave me much surprise, but not at the time being in personal contact with the matter it was simply stored mentally for future use.

The advent of the Diesel engine to Australia, and the gradual closer contact with the subject caused me to make enquiries, and to my intense surprise I recently found that it is apparently generally understood that under emergency, in the case of the exhaustion of the compressed air supply for starting, and the inability to obtain a supply of compressed air in cylinders, it is permissible to utilize a cylinder of oxygen.

Upon reference to "Power," dated 27th August, 1912, it is recorded that:

"On July 10th, at the municipal plant at Bray, in Ireland, a Diesel engine of 50 H.P. was being started up, when a violent explosion took place, killing one man outright, blowing a foot off the Chief Engineer, and injuring his assistant. According to the latter, the compressed air in the starting reservoir had failed, and lacking means to compress a fresh supply, a 40 cubic foot cylinder of compressed oxygen was obtained for starting the engine."

The article, after describing the accident, further states:

"There was nothing unusual in the use of oxygen, although Carbon Dioxide is perhaps preferable, and doubtless if this gas had been used the explosion would not have occurred."

It is plainly evident that it is generally considered permissible to use compressed oxygen, but with the evidence of the accident before us and above all with the experience of those used to the testing of liquid fuels in the old forms of calorimeters there should be, I consider, absolutely no question that compressed oxygen should not be used for starting internal combustion engines of any kind, and it is evidently necessary that this warning should be published.
With the chemical or thermal explanation of the explosion under notice this paper has nothing to do; the description of the accident is available to any member of the Institute; but the object of this paper is to bring distinctly under the notice of Australian engineers, and through them to the Australian users of internal combustion engines the warning that under no circumstances whatever should compressed oxygen be used for starting purposes.

DISCUSSION.

The President said the Institute was indebted to Mr. Rowe for bringing the matter forward. It was informative, and a very proper warning. He felt bound to say he regretted the concluding sentence of the paper—"with the chemical or thermal reasons of the accident this paper has nothing to do." It was regrettable that Mr. Rowe had not given his views on that point, and a warning such as he intended the note to be would be infinitely more effectual if a satisfactory explanation had accompanied it, so that a good reason for the warning could be given. It was an important question indeed to know what happened—whether the cause of the explosion was thermal or from some extraneous cause, and at what pressure the cylinder of oxygen was used. One remarkable thing in the paper was the citation from the article, which said there was nothing unusual in the use of oxygen, although carbon dioxide was perhaps preferable. If that were so then he certainly thought Mr. Rowe had made good his case for publicity. He thought Mr. Rowe deserved the thanks of the meeting for bringing the matter forward.

Prof. H. Payne said personally he did not see why oxygen should ever be applied to those engines. There ought to be no necessity for it. If experienced men were dealing with the Diesel there should be in the starting reservoir an ample supply to start a Diesel at least four times.

Mr. Jas. Alex. Smith said the paper was one that might profitably lead to a technical discussion on the lines laid down by the President. He could endorse the statement that a warning had been recognised as necessary, for the makers themselves, in the pamphlets sent round last year had an insert in a bold red print, warning that under no conditions whatever must oxygen
be used, as it had been proved to be exceedingly dangerous. So the warning Mr. Rowe had given could not be too often repeated.

The President thought members would prefer to see the paper in print before entering upon a discussion. He therefore adjourned the discussion till next meeting.
Whilst buzzā chips is a fair material from the point of view of radiation alone, it would be doubtful economy to employ chips in any but very small cool store-room partition walls, as other considerations besides heat radiation have to be taken into account.

In relation to the curves plotted from the results of the shake tests, the author considers that it is not advisable to reason much beyond the range of experiment, unless other facts be known which help to guide forward reasoning, in the absence of which he cannot concur with the deductions brought forward by Mr. Smith in discussion.

He would take the liberty of adding to the data in his paper that the co-efficient for pumice is 0.439, for buzzā chips 0.377, whilst for the wooden partitions lined with refrigeration brown paper the co-efficient was 0.258.

In conclusion the author desires to thank members for their kindly criticism of his paper.

DIESEL ENGINES: A WARNING.

Mr. WM. CHAS. ROWE said he had to thank the President for the remarks he had made. The President had regretted that he had not gone into the matter from a chemical or thermal point of view. But the object of his paper was, first and foremost, a warning. In connection with that he thought simplicity was, perhaps, the paramount thing to aim at, and he might have complicated the matter by going into suggestions of reasons for the trouble, which might have had the effect of taking attention off the warning. The account of the accident was purely a journalistic one, and unless one were at the spot, and able to investigate the matter directly, one could not say too dogmatically what was the cause of the accident. The journal stated that the fuel valve was shattered, and a secondary explosion then took place in the exhaust chamber.

Internal combustion engines consumed their fuel by flame action more or less rapid—usually less rapid. The position was this—if they had a unit of fuel burned in a unit of time there was a certain power developed. If they burned that unit of fuel in half the unit of time there would be double the power developed, and if they burned the fuel in an immeasurably short space of time the result would be something approaching detonation. And
that was what evidently took place. When they considered the
efficient method of injection of the fuel into the Diesel engine, they
had in conjunction with the use of oxygen and the high temperature
due to compression all the factors for getting intensely rapid com-
bustion, and it seemed to him that that was solely the cause of
the accident, and pointed to the warning that oxygen should not
be used. What surprised him was that engineers should ever
have suggested the use of oxygen. Anyone having the slightest
knowledge of combustion should have said it was the last thing
to use. Under these conditions his object had been to give a
warning, and if that had been successful he was highly gratified.

NOTES ON PILE DRIVING.

The President said that while inviting discussion on Mr. M.
E. Kernot’s paper he thought it was hardly a matter which per-
mitted of discussion in the ordinary sense. It was a very com-
plete, illuminating, and interesting record of pile driving experi-
ence, and except for the fact that one might, on a close scrutiny,
have a different opinion as to the methods employed in reaching
those results, there was no room for discussion, and personally he
thought that the whole design of the experiment and the system-
atic manner in which it was carried out were so admirable that
the author had left no room for comment. He should like to add
that the question of pile driving was still a very open one, and one
in which engineering practice was highly empirical. It afforded
scope for research, and they awaited a good deal of data whereby
the engineer could determine with confidence the static loads to
be carried by piles under varying conditions.

The discussion was closed subject to the author’s right of
reply.

Mr. M. E. Kernot writes that as there was no discussion he
has nothing further to add except that he hopes that he will be
able to submit, during the next session, the results of some
further investigations into pile-driving in difficult ground.

LECTURE.

The President introduced Mr. J. T. Wilkins, Deputy Chief
Officer of the Metropolitan Fire Brigade, who was to bring before
them a subject, of which he was a master. He was pleased to