member; R. J. Thomas, member; Robert Thompson, member; G. H. Thomson, member; W. J. Turnbull, member; H. H. Wake, member; W. H. Wellsted, member; H. P. Allison, associate member; Thomas Arnold, associate member; T. Scott Anderson, associate member; C. J. Seymour Baker, associate member; Robert S. Ball, associate member; Thomas R. Bayliss, associate member; H. F. T. Bode, associate member; E. F. S. Bowen, associate member; F. W. T. Brain, associate member; W. H. Brinckman, associate member; T. Copley Calvert, associate member; J. Campbell-Thompson, associate member; Alfred Chatterton, B.Sc., associate member, Madras, India; Francis G. Coles, associate member; Arthur Coles, O. F. Wheeler Cuffe, associate member, Burma; William Eckstein, associate member; Fred. J. Edge, associate member; S. E. Fedden, associate member; J. M. Gavin, associate member; James Goodman, associate member; Robert Campbell Grant, associate member; C. D. M. Hindley, M.A., associate member; E. P. Hooley, associate member; M. Rhys Jones, associate member; H. Birch Killon, associate member; J. W. Malcolmson, associate member; Mr. Malcolmson, Jr.; R. J. Gifford Read, associate member; Frank Roberts, associate member; R. W. Roberts, F.C.H., associate member; C. P. Sandberg, Jr., associate member; J. R. Sharman, associate member; E. R. Stokoe, associate member; W. C. Wallace, associate member; Francis Wilton, associate member; J. T. Middleton, associate; E. K. Middleton, Joseph Randall, associate, Woolwich dockyard; G. R. Redgrave, associate; F. C. Appleton, student; J. H. Burman, student; F. W. Cable, student; E. C. Q. Henriques, student; O. B. Lacey, student; E. T. Newton-Clare, student; L. T. Payne, student; G. B. Hunter, A. H. White, of H.M.S. Ariadne, son of Sir Wm. White; H. T. Griggs, assistant secretary.

A TIMELY WARNING.

The following circular has been issued by the Canadian Casualty and Boiler Insurance Co., and is being distributed to engineers:

We herewith enclose you a newspaper report of the recent boiler explosion at the works of the Toronto Bolt and Forge Company's mills, Toronto, which you will see was quite disastrous.

This boiler explosion is the third which has occurred during the last three months in the province of Ontario, and in each case the cause has been traced to negligence, demonstrating that boilers do explode, consequently, we now write requesting that you caution your engineer concerning the safety valves, glass water gauge, try cocks and blow-off pipes.

These should always be kept in perfect working order, the first, that it may relieve the boiler of any undue increase of pressure, the second, that the exact height of water in the boiler may always be correctly known, and, the third, that they may not leak and cause a dangerous shortness of water.

SOME USES FOR THE WASTED HEAT OF GAS ENGINES.

One of the most difficult problems in the transmitting or the generating of power is to reduce to a minimum the waste. For instance, in the steam engine every effort is made to reduce, as far as possible, the amount of heat (for heat is recognized as a form of energy) that is radiated from the steam pipes, the cylinder, etc. Not only this, but the amount of steam that is exhausted is usually returned eventually to the boiler in order to avoid heating that much cold water. It is found that the apparatus required more than pays for itself in the end.

The same precautions are used, in a different way, in the gas engine. Here, owing to the very high temperature of the burning gases, it is found inadvisable, even if it were possible, to prevent the carrying away of a portion of the heat by using cooling water, or other means. Nor has it been found possible to avoid the waste of a great deal of this heat in the escape of the burned gases when exhausted. Still, considerable progress has been made within the last twenty years in reducing the losses of this character, and thereby increasing the efficiency of the gas engine.

Mr. Dugald Clerk, the noted English expert on the subject of internal combustion engines, called attention to this very matter in a lecture delivered some months ago before the Institution of Civil Engineers. He presented a table of tests of engines from 1882 to 1900, which is given on this page.

It will be seen from this that the amount of heat transformed into work has increased from 16 per cent. to about 28 per cent., and even as high as 30 per cent. has been claimed in some cases. The amount of heat lost through the water jacket has changed from slightly over 50 per cent. to a little over 24 per cent. On the other hand, the amount of heat lost through the exhaust has increased from about 30 per cent. to about 40 per cent., or even higher. While, therefore, there has been a gradual increase in the total amount of heat utilized, yet of that portion wasted there has been a change in the proportion lost in the exhaust and that lost in the cylinder cooling.

		Heat Distribution.			
		Jacket.	Exhaust.	Difference.	Work.
Experimenter.	Year.	Per cent.	Per cent.	Per cent.	Per cent.
Slaby	1882	51	31	2	16
Thurston	1884	52	15.5	15.5	17
Society of Art Trials	1888	43.2	35.5	....	22.1
" "	1888	35.2	39.8	3.9	21.1
Capper	1892	38.9	40.5	....	22.8
Robinson	1898	33	38.3	....	28.7
Humphrey	1900	24.2	48	....	27.8
Witz	1900	52	20	....	28

What to do to utilize this wasted energy is a thing that has appealed to many a user of a gas engine, after he has learned that he must not expect to be able to prevent some waste in the operation of his engine.

In the first place, the water from a water-cooled engine usually should issue from the engine cylinder at about 160 to 190° F. in order to get the best results from the engine. If the water is kept cooler, it carries away too much heat, and the object is to keep the water as hot as possible and get efficient results. If the water is kept hotter than 200° F. it is very close to the boiling temperature, and when it turns to steam in the water jacket it ceases to prevent overheating of the engine.

This hot water is used for a number of purposes. Factory employees use it for washing purposes. Where low pressure boilers are used for heating or other service, as in steam laundries, the hot water is carried to the boiler just as the condensed water from a steam engine exhaust is returned to the boilers.

When used in hot water heating pipes the water will do more or less heating, depending on the size of the engine. In some factories, flour mills and elevators it is not necessary or desirable to maintain a very great heat, even in cold weather, for the employees are working and do not require very much heat, unless the weather is very cold. In such cases the hot water, combined with the use of the exhaust, as will be described later, will usually suffice for heating service at least the greater portion of the year, unless a very large building is used. Many small machine shops use such a system with the best of satisfaction.

In pattern shops the hot water is used to heat the glue pots. In fact, almost any requirement for a medium quantity of hot or warm water can be met by utilizing this waste water from the engine.

Of course, where a water tank is used it is often not advisable to use the water for the reason that by returning it to the tank it reaches the engine again before getting as cold as fresh water would be, and there is less heat carried away than if only cold water entered the cylinder. But in such cases the water may still be used for heating purposes by passing it through radiating pipes before returning to the supply tank.

The exhaust gases from the engine may also be utilized in heating service by passing the hot water pipes through the exhaust pot, or muffler, close to the engine. In such