

# MARINE ENGINE GOVERNORS.

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THE WRITER does not propose to go into the mechanical question, but is more particularly desirous of bringing before your notice some facts connected with Marine Engine Governors which may not have presented themselves to your minds ; also to meet objections sometimes raised to their detriment, feeling confident that if they were more thoroughly understood, they would be much more highly appreciated, and the frivolous objections sometimes raised would be appraised at their real value.

Judging by the writer's experience, which is far from limited, Governors have rarely received the attention they deserve. They have a very considerable and direct bearing on, or connection with, the question of preventable damage and losses at sea, consequently they ought to receive special attention from those interested.

Where human life and enormous amounts of valuable property are at stake, it is the bounden duty of all concerned, whether owners or otherwise, to insist on every possible precaution being taken to minimise the risk ; therefore, any appliance or arrangement which in any way tends to this desideratum demands careful and prompt consideration. Political economists tell us that every loss, whether of life or property, is a national loss, and is not confined to the individual.

It is not necessary for the writer to explain the Mechanical details and action of his own Velometers and Governors, seeing that there are upwards of 2,200 of them in use, which may be accepted as ample proof of their efficiency.

The Compound Attachment is an arrangement actuated by the Governor, by which all the cylinders may be controlled. If perfect Governing is required this should be fitted in all cases.

The writer's remarks refer solely to Governors operated or driven by the main engines, as he considers all others are but very poor apologies and not entitled to the name of "Governor," as they have only occasional control over the engines, not available in case of accident, whereas, a real Governor, properly fitted and worked, has continuous control over all the cylinders under all conditions and circumstances.

Governors are frequently fitted in positions most difficult, sometimes dangerous, to get at, giving the idea that they are not intended to be used, only viewed from a distance. Consequently they are not always kept in proper working condition, much less continuously at work, as they ought to be. This is not fair to the makers, and, unfortunately, they are not in a position to insist on proper fitting and operation of the machine.

A strong protest ought to be entered against Governors being considered as only rough weather attachments. They are *that* and very much more. A Governor is as much an integral part of an engine as a safety valve is an integral part of a boiler, or an automatic brake is of a train. The law compels you to fit these to prevent accident. For precisely the same reason it ought to be compulsory to fit a Governor. A Governor is, pre-eminently, a safety appliance, and not as most people imagine, simply a machine to prevent racing. It is a safety appliance directly affecting, as it tends to prevent or minimise the effects of a break down, and possible loss of life and property at sea, and as such it ought to receive very special attention from those responsible for the lives of our sailors and passengers.

The machine ought to be so fitted as to be easily accessible from the starting platform, and so that whenever the engines are at work it shall be in operation. It ought not to be optional with, or even left to the discretion of, the engineer on watch to decide when it shall be put on, unless you can make it optional with him, or leave it to his discretion, when an accident shall happen. It is an automatic check in case of accident, and common sense and common humanity demand that it should be a permanent attachment and continuously at work.

A good Governor, if properly fitted so as to control, at any rate,

two out of the three cylinders, will prevent racing, but it is unreasonable to expect it properly to control a three or four cylinder engine when it only has hold of the H.P. cylinder, thus leaving two-thirds or three-fourths of the engine uncontrolled just at the most critical moment. If a Governor and Compound Attachment are properly fitted to an engine, no matter how many cylinders it may have, it will be held under perfect control with full steam on, and the ship may be driven,—so far as the engines are concerned, and without reference to those on deck—at full speed in the heaviest weather, and there will be no indication of racing.

It is in heavy weather when the engines are subjected to violent shocks and stresses, caused by excessive and sudden variation of load, that the damage commences, but owing to the engines being eased down, the beginning of an accident does not then appear. When the weather moderates the real danger of a break down arises, as full steam is then put on, stressing everything to its utmost, and then follows the collapse.

Perhaps it has never occurred to many to notice when break downs take place. By far the largest proportion occur in fine weather, and not in rough weather. It is in fine weather that the engines are most severely pressed. If the shaft breaks, the engines will fly away at an unknown speed, and, before the engineer has time to think, much less to act, it is through the ship's side or bottom, or the stern is pretty well shaken off, in either case producing serious leaks, as in the case of the s.s. "Danmark," where some 800 lives were in peril from this very cause. If a good Governor properly fitted is continuously at work the engines could not practically exceed their normal speed; thus the danger and damage would be reduced to a minimum in case of accident, as it would give the engineer in charge a chance to stop the engines before much damage could be done.

The injurious effects of racing are felt throughout the whole engine and its fittings, and the author cannot do better than quote the words of a well-known writer on this subject, Mr. T. G. Barron, who speaks from long practical experience at sea. He says: "When an engine attains suddenly a speed of double the number of revolutions per minute at which it is intended to run, and is as suddenly brought up to its normal rate, it may be said to be racing, although very much worse racing than this is common enough; and the whole strain of the sudden check to the engines, caused by the extra resistance offered by the water to the propeller as it dips, after being partially or wholly

lifted out of the water, must necessarily be transmitted through the whole length of shafting and coupling bolts from the propeller shaft to the crank shaft. If the Governor is quick enough to check the racing before the propeller is again immersed, the twisting strain to the shafting will be avoided, or at least greatly reduced. There is also a severe straining to the pumps, pump rods, and links, caused by the racing, the pumps being unable to deliver the water quickly enough; and the bucket valves coming down heavily on the surface of the water put extra weight on the rods and other gear, as well as destroying the valves. The feed pumps being only partially filled with water, and the rams coming suddenly in contact with it give a shock to the barrels of the pumps, and also to the pump crosshead, etc., which is not the case when running at their normal rate. A continuance of this vibration loosens the foundation plate of the engine, and in fact it would be difficult to say where the evil of racing ends, and it is only necessary for the shipowner to know a small portion of it in order to see the benefit of a thoroughly efficient Governor."

Only quite recently we have had reports of serious damage having been done by racing to the pump valves, condenser doors, etc. In one case the condenser doors were cracked, and the main steam pipe caused to leak, necessitating the stoppage of the ship at sea for repairs, generally a very difficult and dangerous operation.

Amongst other very serious results of racing is the loosening and frequent fracture of the stern tube and bush, and damage to the hull caused by excessive vibration; also the great alarm it causes on board passenger steamships, a serious consideration, though it has neither a mechanical nor economical bearing.

There is also the prejudicial effect of vibration, such as that produced by racing, on the chronometers and compasses. This is confirmed by the leading makers of these instruments.

If an ungoverned engine gets away, which it may easily do, to three or four times its normal speed, it will cause considerable agitation of the water in the boiler, materially facilitating, if not actually causing, priming, especially in boilers so inclined, thereby incurring the risk of serious damage in the steam pipes by water hammering, and breakages in the cylinders. The condenser is liable to become overheated, owing to the circulating pumps not working efficiently at racing speeds, causing partial or total loss of vacuum when the full

power of the engines is required, danger of leakage, and breakdown of condenser through undue expansion and contraction. These difficulties can only be overcome either by throttling (wiredrawing) the steam, or else linking the engines up, in both of which cases there is a material loss of power and speed, which can almost entirely be avoided by the use of a proper Governor.

It is sometimes stated that even if triple engines do race, it is not as objectionable as with two crank engines. Such a remark can only apply to one's personal comfort, as acceleration of speed means a considerable increase of wear and tear.

All experience proves that under similar conditions a three crank engine will get away more quickly, and run at a higher speed, than one with two cranks. Granted the three-crank may run more smoothly than a two-crank, and its racing, therefore, would not be so uncomfortably perceptible; but all other objections and risks remain, and if anything, are increased.

While compound engines were in vogue, there was hardly an engineer but who insisted on having them fitted with reliable Governors; but since the introduction of the triple compound engine, an idea seems to have got abroad that they do not require Governors—why or wherefore it is difficult to explain.

There is no doubt that the late low prices and keen competition have considerably militated against Governors; and the writer cannot but think it is a "Penny wise and pound foolish" policy to cut them out of the specification. A paltry saving of a few pounds as compared with the value of human life, and the jeopardising of such enormous interests, seems a parsimonious course.

Some engineers maintain that triple expansion engines "being so well balanced," do not require Governors. Now it appears to the writer that this is an idea that has been adopted without due consideration, and he hopes to prove the argument untenable.

So far as the writer can learn from these gentlemen, the balancing consists in the engines having three cranks, thus giving a more uniform turning moment to the crank shaft than in the compound engine. No one will deny that the three cranks may balance each other, but *there* the balancing ends, for as soon as you get away from your cranks the unbalancing commences: first of all in the weights of the pistons:—the

L.P. being from four to six times the weight of the H.P.: then, secondly, there is frequently a very large discrepancy in the power developed by the respective cylinders, which fact seems to have escaped the notice of the disbelievers in Governors.

Of course, this statement may be met with the remark that such ought not to be the case. It is admitted that it *ought not to be*, if it could be avoided, but it cannot be denied that through some cause or other this is invariably the case.

The writer originally intended to have got together as large a number of indicator cards as possible, and from them to have worked out the indicated powers, but on further consideration it occurred to him that he might be charged with selecting only those cards which would support his line of argument. To avoid anything like a suspicion of this he turned to the technical journals for information, for authoritative information, and there can be no question of incorrectness, the articles having been prepared by those who knew exactly what they were writing about, thoroughly competent men, who have undoubtedly presented to us the best phase possible of their respective engines.

The writer has referred to all the accounts he could find in these papers of the trial trips of a number of steamships fitted with triple compound engines, and finds that the discrepancy between the power developed by the cylinder doing most work and that doing least in any one engine is not less than 34.02 % on the average. The analysis of these discrepancies is very interesting.

On reading this paragraph over to an engineer the writer was met with the reply:—"The L.P. generally indicates more than the H.P. because of the pumps." This led him to analyse the cases in question, with results as follows, which are scarcely in keeping with the explanation given.

H.P.	is highest in	33 <sup>3</sup> / <sub>10</sub>	of the cases.
I.P.	" "	16.66 <sup>6</sup> / <sub>10</sub>	" "
L.P.	" "	50 <sup>0</sup> / <sub>10</sub>	" "

On further analysing this the writer finds that the

H.P.	is highest and	L.P.	is lowest in	33.33 <sup>3</sup> / <sub>10</sub>
Int.	" "	H.P.	" "	16.66 <sup>6</sup> / <sub>10</sub>
L.P.	" "	H.P.	" "	33.33 <sup>3</sup> / <sub>10</sub>
L.P.	" "	Int.	" "	16.66 <sup>6</sup> / <sub>10</sub>

These discrepancies, it must be borne in mind, have all appeared when the engines have been working under the most favourable conditions, and when in the hands of the most skilful men, working under the closest supervision of those interested in obtaining the best results. When these engines are put to their ordinary work these discrepancies come out very much heavier. The best engine included in the group giving the above average only showed a discrepancy of a little over 10°/o in the published report of her trial trip, but the writer has seen numbers of her cards under ordinary working conditions, and finds that the difference is never less than 23°/o.

In the trial trip reports 71·42°/o of the cases show a discrepancy of 25°/o and upwards, and 21·42°/o show discrepancies of upwards of 50°/o. It is a remarkable fact that not one of the engines referred to in the reports on the trial trips is anywhere near being balanced, and some of them in ordinary work show more than double the difference indicated on the trial trip.

The writer considers the above figures pretty well dispose of the theory of perfect balancing, which is so frequently referred to in contravention of facts, and fully proves the fallacy of ignoring Governors, on this ground, at any rate.

Not long ago a friend of the writer's was in treaty with a well-known engine builder for a pair of triple compound engines. When they came to the question of Governor, the builder assured the intending purchaser that he built engines strong enough to stand any amount of racing.

The writer, to convince his friend that the statement was not true, took the trouble to hunt up the breakdowns of engines built by these particular builders. It is certain they would not like the writer to reply to their ad-captandum statement by publishing the list, which contains a good round "baker's dozen" within a very short period.

There is a proverb about those who live in glass houses, etc. The engine that cannot break down has not yet been built.

During the last eighteen months the writer has received particulars of 217 accidents to cranks, screw shafts, and propellers at sea. This number is exclusive of fractures and other defects found out in port and repaired. Out of the number 127 were broken shafts, in every one

of which the safety of the ship, and the lives of the crew and passengers, were more or less imperilled. The cases referred to, doubtless, only form a minor portion of the total accidents.

Besides these, there are numbers of screw steamers missing every year with all on board, and the writer is supported by competent authorities in the opinion that the major, or at any rate, a very large portion of these, have gone to the bottom through accidents similar to that which occurred to the s.s. "Danmark," where the broken shaft pounded a hole through her bottom. Doubtless, all have heard of many very narrow escapes from similar causes in which they have only just had time to get the bulkhead doors closed and so save the ship.

It is hoped that the facts set forth in this paper prove the necessity of having a thoroughly efficient Governor, properly fitted, and continuously running. Of course, it is impossible for a Governor to prevent breakdowns, but when they unfortunately occur the effects are minimised.

The following is an extract from a letter received from a well-known engineer:—"The non-fitting of a Governor is a piece of culpable negligence"; expressing an opinion in which all interested in steamships should fully concur.

The writer trusts he has succeeded in bringing forward and establishing many reasons why Governors should be fitted. Many of these reasons he has never heard referred to in discussing the question, and can only conclude that they are not generally known. If these facts cause Governors to be considered as necessary permanent attachments for marine engines he will feel that his work in preparing this paper on "Marine Engine Governors,—Beneficially considered," has not been spent in vain—and trusts the future will prove that he has, if only in a small degree, contributed something to the comfort and safety of those at sea.

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#### CHAIRMAN'S REMARKS.

(MR. J. MC F. GRAY.)

The Marine Governor is a subject upon which most of those present ought to be able to speak from their own experience. If Governors, where they are already fitted, were kept in action



continuously on the voyage, irrespective of the state of the weather, as is recommended by the author, they would be likely to be better attended to, and the refinements of their action would become better understood by engineers, and the improvements still required in their construction would be hastened. It is only by continuous action that their utility as safety appliances can be tested. The Marine Governor requires but little steam to drive it, it occupies little space and its cost is out of all comparison insignificant in relation to the value of life and property it may be the means of saving by minimising the damage done when a shaft breaks, when under way. It is in this respect like one of the many automatic nerve actions with which the human body is provided. To save the eye from a blow the eyelid shuts and the hand is raised, and, in falling, the hands are spread out, without conscious thought. The Governor arrangement, which does this for *us*, is always in gear, even when a fall or injury to the eye is least to be expected. When a Governor does not act satisfactorily, the engineer ought to report it and have it put right or else taken away. I remember having to go to examine a Governor which had been in this way condemned by the engineer. I found that the connection had been wrongly made; the Governor was set to open the valve when it ought to have been shutting it. I had it altered, and there were no more complaints about its action. I am afraid that a great deal that is said against Governors has originated in such mistakes. Governing the throttle by hand, for hours in succession, is a nagging, tiresome job, more suitable for a mechanical automaton, which the Governor is. It is difficult, if not impossible, to control the throttle by hand to limit the variations of speed within as small a range as can be maintained by a good mechanical Governor. Very hazy notions are sometimes held about the degree of variation of speed within which the screw continues to be a propeller. Whenever the speed of the screw is effectively less than that corresponding to the speed of the ship the screw is a drag, not a propeller. If when the engines are running at 60, the slip is 10 per cent., then when slowed to anything below 54—the speed of the hull not having altered—the action becomes a sternward pull upon the hull. Negative slip is not at present considered. The velocity with which the flat of the blade strikes the water is, about, as the difference of the revolutions above or below the number which gives the speed of the screw the same as the speed of the ship. That difference in the numerical example given was six; when the revolutions are 72 this difference becomes  $72 - 54 = 18$ , and then the flat of the blade strikes the water at  $\frac{1}{6}$ <sup>s</sup>, three times the velocity with which it acts when

running 60, the speed of the hull all the time corresponding with 54 revolutions per minute. When the revolutions are just this number when the stern dips and the blades enter the water, then the shock on striking the water is least—it is wholly edge on.

When the screw re-enters the water at double the ordinary speed of rotation the relative velocity with which the flat of the blades strike the water is eleven times greater than its ordinary pushing velocity with 10 per cent. slip, and it must be very detrimental to shafting to be subjected to the frequent excessive strains which are in this way produced by racing. A good Governor ought to keep up the speed of rotation to be something over the normal speed when the blades are again being immersed, so that, as the stern descends, the revolutions may not be diminished below the normal speed.

Although the paper does not describe any particular make of Governor, it would have been better if we had had drawings of different kinds before us during the discussion. As I have not seen the Compound Attachment which is named in the paper, I would be pleased if Mr. Churchill would describe to the meeting, how the valve controlling the low-pressed is constructed, as I am sure few of us have seen the arrangement applied. Will he also tell us about what size the connecting pipe is, and what is done to prevent the volume of this pipe from adding to the unavoidable waste capacity at the ends of the cylinder?

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#### MR. ROWE'S REMARKS.

For the last ten years I have observed how reluctant Engineers are to use the Governors supplied to their vessels, to keep the engines from racing in stormy weather. Now every effect has a cause, and no doubt the Chief Engineers who are present will be able to explain the somewhat strange fact I have called attention to. I agree with Mr. Churchill that excessive racing is likely to reveal defects in shafting, and sometimes lead to breakdowns. In my opinion a reliable Governor is a most useful adjunct to marine engines. Opinions might differ as to which type of Governor is best; but though the pendulum type is simple, and does not depend upon the accelerating motion of the main engines, it is non-effective when the vessel is running in heavy

weather, because the whole depth of the stern post (including, of course, the propeller) is frequently exposed to view by the rapid passage of a following wave. I have often observed this, even when long vessels were on a level keel.

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#### MR. L. P. COUBRO'S REMARKS.

My experience bears out what has been said by Mr. Rowe about Engineers not taking the trouble to put on the Governor in heavy weather, as, during my short experience as a sea-going Engineer, I have a lively recollection of many uncomfortable hours "standing by" the throttle valve. I think that if, when ships were in course of construction, the Governor were so placed as to be easily accessible and easily put in gear, this would not be the case to such an extent as at present. I believe the Chairman went to the root of the matter when he said that, in a great many cases, where it was said the Governor was not working properly, some slight mechanical defect was all that was wrong; and that, if it were so placed as to be easily got at to be overhauled and repaired, instead of being stuck up, when fitted originally, in some out-of-the-way corner (as is frequently the case at present), we should hear less of the Governor being only a useless ornament in the Engine room.

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#### MR. W. W. WILSON'S REMARKS.

In continuation of the remarks by Mr. Rowe, might I suggest that perhaps most of the Engineers who have related their experiences or have expressed their opinions as to the non-use of their Governors, had a similar experience to myself regarding them. Some years ago, when I was sailing as Junior Engineer in a certain ship, we encountered very bad weather on one occasion and the Chief Engineer decided to use the Governor instead of throttling by hand as we had been doing. The pulley for driving the Governor was fixed on the shaft, between the turning gear wheel and the bulkhead, which was a very limited space, and to get the rope adjusted into its proper position for being tightened fair on this pulley, one person had to go down

into the bilges on one side of the shaft and another on the other side. In the instance referred to, the second Engineer who had charge of the tightening gear lever, either used too much force on the same, or tightened too early, and the consequence was that the rope caught, broke, lapped round the shaft and jammed itself firmly between the pulley, coupling bolt, heads, and bulkhead, we (the engineers who were below) narrowly escaping being drawn round the shaft with it. I think as far as I can remember, so long as I remained in that ship, the Governor was never used again.

Now I contend that in a large number of ships fitted previous to ten or twelve years ago, these pulleys for actuating the Governors were placed in far too inaccessible positions, and rather than risk their lives trying to get the Governor in gear, the Engineers preferred to work without it and continued to throttle by hand. I know that now in most of the new ships, more attention is paid to the fixing of these pulleys in better and more accessible places, and in one vessel in which I subsequently served, we had a very good arrangement, driven by friction, and which was easily put in gear without incurring the slightest danger.

This worked very well indeed when required, the only trouble being the stretching of the driving rope.

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#### MR. F. W. SHOREY'S REMARKS.

I am not acquainted with the Churchill Governor, but if I understand rightly, Mr. Churchill said that with compound engines he connected a pipe from the high pressure cylinder to the top and bottom of the low pressure cylinder, so that when the speed of the engine was accelerated, the Governor was so adjusted as to close a valve in the pipe of the H.P. cylinder, and open valves in the pipe of L.P. cylinder, and admit steam on both sides of low pressure piston, thereby making the pressures equal on both sides of low pressure piston, and retarding its motion.

This I take it, would apply to compound engines only, and if such is the case, how would Mr. Churchill apply it to triple and quadruple engines? Would he, in the case of triple, control all cylinders alike?

That is to say, would he control the intermediate engine, by admitting steam from the high pressure cylinder to the top and bottom of intermediate piston, and in like manner control the low pressure piston by the steam from the intermediate cylinder ?

In my opinion, the reason why so many Engineers discard the use of the Governor in bad weather, is that many of the Governors fitted to engines do not act quickly enough to check the engines racing, and the Engineer finds that he can do it much more effectively by working the throttle himself.

I have some very unpleasant recollections of crossing the Bay some years ago. It was in the month of November, and we had some very dirty weather, and the engines were racing very much. We put on the Governor, which was one of Silver's ; but found we could not get it to act quickly enough to be of use, so had to disconnect it, and work the throttle valve by hand, finding this means more effective.

Now, what we want is a good Governor that will anticipate the racing, for it would be a great boon to Engineers ; they could then rely upon the Governor to regulate the speed of the engines, whilst they attended to other things requiring their attention in the engine room and stokehole, many of which must be neglected if they have to stand by the throttle valve.

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#### MR. JAMES ADAMSON'S REMARKS.

Our thanks are due to Mr. Churchill for bringing this subject forward in the manner he has done. I was pleased to find that the Paper he proposed to read dealt with principles rather than specialities. The resulting discussion should therefore be educational, not personal ; this is entirely in accord with the views of the Council, views which, when I expressed them to Mr. Churchill, he endorsed in words at the time, and this evening has done in deed.

We have all had some—many here have had much—experience of Governors, good, bad and indifferent in their action, and I should say from what I have observed, Marine Engine Governors are, as a

rule, not held in much esteem. They are neglected and only used occasionally, and seldom looked upon in the light that they are held by the author in the Paper just read.

Some time ago my attention was called to the want of action in a Governor. I found the connecting rope had been placed to run the reverse way to the intention of the maker, and closed the valve when the reverse action was wanted. There were other defects in connection with the gear, which were sufficient to indicate a great want of attention to the details of fitting and to the efficient working of the Governor.

I am of opinion that a good Governor is a desirable addition to the outfit of an Engine ; but it seems to me that something is wanted to call attention to the services which may be rendered by a reliable Governor, and at the same time ensure that the connections are properly made and fitted ; this, I apprehend, is one of the objects aimed at in the Paper.

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#### MR. W. J. N. BRETT'S REMARKS.

As my opinion, I should like to state that I do not think the hand can manipulate the throttle valve in such a sensitive way as a good steam automatic Governor. As an instance I will mention the Churchill Governor fitted to the P. & O. "Oceana," which for its work is an efficient and very beautiful mechanical contrivance, acting on a very slight change of speed, and, I believe, serving its purpose well.

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#### MR. A. SCOBIE'S REMARKS.

In reference to the Governors for Marine Engines, I may say I have had experience of them during 25 years as Chief Engineer of different vessels, and always found when the ship was pitching heavily the Governor was of little service in preventing the engines from racing, as when the propeller is leaving the water it closes too late, and does not open soon enough when the propeller is being fully immersed. I have found when the ship gives a heavy sudden pitch, the valve closes

and the Governor has not sufficient power to open it, thus frequently involving the use of the crow-bar, or other outside means to open it. On one occasion, what nearly proved a very serious accident happened to a ship I was in, on account of the valve closing and jamming. During a heavy gale the ship was pitching badly, when suddenly she gave a heavy plunge and the valve shut with great force, and held so that the main stop valve had to be closed to remove the pressure off the back of the valve before it could be opened; while this was being done, the ship lost way, and could not be kept by the rudder; she fell into the trough of the sea, and rolled so heavily that everything loose on deck was carried away by the sea. When the Governor valve is closed the full pressure of steam acts on the back of the valve, so that if the Governor springs and rods are not sufficiently strong to open it, the artificial means I have referred to, have to be used. I may also mention that before this accident took place, the Governor had been at work for several hours and to all appearance doing well, but still, not acting at the right moment, until the ship took the extra sudden pitch and jammed the valve and kept it from opening. I have had immediately to disconnect the Governor and work the engines with the hand throttle valve during heavy pitching.

I understand there are some *improved* Governors now in use, acting much better than those I have had experience of. The makers of these I hope will allow sufficient strength in the springs, rods, and connecting gear, to open the valve when closed suddenly, owing to the heavy pitching of the ship and the steam pressure acting on the back of the valve.

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#### MR. J. H. THOMSON'S REMARKS.

In vessels constructed to run, say, at about sixteen knots per hour, and while under ordinary circumstances it may not be necessary to exceed twelve or thirteen knots, the area of the steam pipe and throttle valve is so much in excess of that required for the lower speed, that the throttle valve to get full control of the engines, must only move through a small arc, and requires to be adjusted for that speed. In many cases sufficient allowance for this adjustment of the levers and rods is not made by the builders.

I sailed for some time in a vessel, which invariably had to be worked at full power, and when it was necessary through rough weather to connect the Governor, it was quite a pleasure to see how well the speed was regulated; however, if we had to reduce the speed, the action was not so satisfactory, and required a readjustment of the levers to obtain a steady motion.

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### MR. W. W. WILSON'S FURTHER REMARKS.

As bearing out Mr. Thomson's remarks regarding the amount of the travel of Governor valves being rendered useless when engines are throttled up, I may mention that when I had just finished my apprenticeship, I had to do with a Governor, which, although not a Marine one, may serve to illustrate the point. The arrangement was, roughly speaking, as follows: A starching mangle and a set of drying cans in a calico printing work, were designed, so that the cloth on leaving the one was passed direct into the other machine. The two machines were driven by separate engines of different sizes. The Governing apparatus employed was a roller properly balanced, and was hung on two standards situated between the two machines, and over which the cloth passed whilst travelling from one machine to the other, the cloth causing the roller to rise or fall as the tension caused by the difference of speed of the machine increased or decreased. This roller was connected by levers to work a valve on the second engine.

When this was first started, difficulty was experienced in so regulating the speeds of the two engines, that the cloth passed through both, without being either torn asunder or coiled up in a heap at the foot of the standards which carried the Governing roller. After adjusting the Governor valve (which was an equilibrium one) by considerably reducing the lift and altering the levers, the machines were so arranged that when the main stop valve, common to both engines, was opened, the Governor so regulated the speed that the machine would work a whole day, if necessary, without once making the slightest hitch, either in tearing the cloth or coiling up the slack, as I have mentioned.



## MR. A. BLAIR'S REMARKS.

I have had some little experience as a sea-going Engineer with different kinds of Marine Governors, of which some do their work better than others.

When I have had occasion to put the Governor to work, and found it did not act properly, I would make it my study to examine into it, also see that the levers were the right length and set properly, the same with regard to the connecting rods, and by doing so I always got them to work very well.

I know of two similar steamers which are fitted with Governors by the same maker: the Engineer of one, when questioned regarding it, replied, that the Governor did not work very well, and that he did not use it. The Engineer of the other steamer when asked how his worked, said he had taken it all to pieces, cleaned and oiled it, as it had been lying in a dirty state and had apparently not been used; he was so pleased when he had occasion to use it after the overhauling and repairing, that he considered the formerly despised Governor as good as another hand in the engine-room. I have sometimes had the same difficulty as Mr. Wilson has mentioned as to the putting on of the Governor rope, when the pulley has been fixed on the shaft between the Engine-room bulk-head and the turning wheel—there being very little space—necessitating an engineer going into the bilges to put the rope on when the vessel has been rolling and pitching heavily.

I have known several instances in which Engineers have put on the Governor, and finding it did not work all right they have taken it off without troubling themselves any more about it.

Again I have known vessels making two and three voyages and at the end of each voyage the Engineer has required some slight alteration to be made in the connections in order to improve the working of it, the alterations being due to no fault of the Governor, and I may say they worked to the satisfaction of the Engineers afterwards when properly adjusted.

A great deal rests with Engineers themselves if the Governors work well or not, it is only by giving a little attention and keeping them in proper working order that they will give satisfaction. I consider a good working Governor to be a great friend to the sea-going Engineer.

## MR. A. W. ROBERTSON'S REMARKS.

I regret I was not present to hear Mr. Churchill read his paper on the Marine Governor. As I have only been here a few minutes, I have heard very little, but from an experience of about eight years as Chief Engineer, I may be allowed to make a few remarks in reference to the old and new style of Silver's Governors that I had to deal with. Unfortunately, I have never been with the Churchill Governor, and therefore cannot speak of its merits; but of the Silver's I would say, that during my experience, I never found it work satisfactorily in really bad weather where there was any driving. In moderately bad weather and fairly easy going, it worked all right, so long as the points put forth by Mr. Blair were attended to. The standing by the throttle valve was always the most efficient in my experience, in the "Navarino" and other steamers.

As the steamer generally rolls when it is pitching, the chief cause of danger through racing is the unequal strain thrown upon the engines by the air pump. At times it works without effect for several seconds, because the water is away from it. At other times it is heavily charged, thereby causing heavy straining and jarring, "that unpleasant working" so well known to the Marine Engineer.

With the Chairman's permission, I will relate an experience I had a few years ago in a steamer from London to Liverpool. The ship was light, and when rounding Land's End the weather was very heavy, with the ship rolling and pitching about. As the Governor was of little use, the Engineer took the throttle valve, effecting a great improvement, but even with that, the jarring through racing sent its shock through the whole of the ship. On rounding Holyhead, we had similar weather, but, "with the air pump disconnected," the vacuum being about the same, the jarring was practically nil, as the faster the engines went the smoother they ran, and I cannot see how the Marine Engine should not be run at the rate of double—or even higher than—the ordinary speed for a few seconds, without creating the tearing and jarring so common with the ordinary Marine Engine, at an increased and varying speed. The Marine Engineer in the future, would do well to consider the advisability of making the engine capable of increased and varying speeds when running in a heavy sea, without the risk of a break down; if this were done, so that there would be a good factor of safety, the *risk* due to *racing* would disappear.

## MR. ROWE'S REMARKS.

In proposing a vote of thanks to Mr. Churchill for his very interesting paper, I hope I will not be misunderstood when I say that Mr. Churchill has probably received information of great value to him. It is important for inventors to learn from practical engineers what mechanical and other difficulties are met with in the working of inventions; and certainly Mr. Churchill this evening has become acquainted with some of the rocks upon which many good Governors have been wrecked.

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## MR. CHURCHILL'S REPLY.

In reply to Mr. McFarlane Gray and Mr. Shorey. This paper which I have just had the pleasure of reading to you deals simply with "Marine Engine Governors, beneficially considered," and does not touch the mechanical question, as I was particularly anxious to avoid bringing my own machine prominently before the meeting. It will afford me great pleasure to comply with your request to read a paper on my own Governor and the Compound Attachment with full explanatory drawings. Mr. Scobie and Mr. Thomson have referred to the difficulty in adjusting some Governors to control the engine at varying speeds. My Governor can be adjusted to control the engine at any speed without any re-arrangement or difficulty. This is a matter which will be dealt with in describing the machine itself. Speaking as regards my own machine I have never known it to fail where it has been properly fitted and kept in working order.



# PREFACE.

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THE LANGTHORNE ROOMS,  
15 & 17, BROADWAY, STRATFORD,

*January 13th, 1890.*

A Meeting of the Institute was held this evening, when Mr. J. G. HAWTHORN read a Paper on "THE MARINE ENGINE considered as a MACHINE."

The Chair was occupied by MR. J. D. CHURCHILL.

The Paper, which is specially commended to the Juniors, and also the Discussion, will be found in the following pages.

MR. HAWTHORN having read his paper, the Chairman made a few remarks, and then invited MR. MCFARLANE GRAY to speak, who, after criticising the methods of demonstration followed in the paper, said he thought all Engineers ought to get a hold of the fundamental principle of the differential and integral calculus. All of the calculus required by Engineers, is much simpler than the rules in vulgar fractions and recurring decimals, which are taught in the Board Schools. He thought it a great pity that children were kept so long working "greatest common measure," "least common multiple," and "repeating decimals," when the same time might be far more profitably spent in acquiring the rudiments of the calculus. These arithmetical rules are never required by practical men, but the rudiments of the calculus if understood by an Engineer, is like a new faculty of the mind to him, which will give him pleasure in exercising it upon problems which he formerly regarded as far beyond his power, but which are now simple and easy.

The attention of Members is called to the Voting Papers which have been issued. It is desirable that such should not be overlooked, but be returned as early as convenient, to facilitate the work of summing up the results on the 24th, for the Annual Meeting on Saturday, 29th March.

It is desirable that Members should, as far as convenient, call at the Reading Room occasionally for notices and papers. With a view to this being carried out, a bookcase is in hand, the lower portion of which will be allotted to pigeon holes for Members, in which all letters and papers will be placed. Members residing at a distance will have their papers posted; but with the object of minimising the expense, it is desirable that, so far as possible, Members should call at the rooms. Members may have private letters or papers addressed to the rooms, to await their arrival in Port or their convenience to call for them.

In connection with the various papers which are due to be read, and the subject-matter discussed, and in reply to several enquiries as to this, Members are invited to contribute to the discussion by letter or written remarks, to be read at the Meeting when the discussion arises, the same may be published in the transactions of the Institute.

A Report of the *Conversazione*, which was held in the Town Hall, Stratford, on the 6th December, is also given, in connection with which a Souvenir was sent to each member, showing a rough sketch of the proposed seal and motto for the Institute. The Council will be glad to have an expression of opinion from Members regarding this, before deciding upon it.

JAS. ADAMSON,

*Honorary Secretary.*

## INSTITUTE OF MARINE ENGINEERS.

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On Friday evening a conversazione was held in the Town Hall, Stratford, in connection with the Institute of Marine Engineers. The hall was decorated for the occasion, and a most interesting collection of models, photographs, engravings, &c., were artistically arranged on either side of the hall. Amongst others of the members' exhibits we observed several beautifully-finished models of NEWALL's patent high-speed engines and other specialities, model and photographs of steamer and engines by J. STEWART, of Blackwall Iron Works, models and photographs illustrating NIXON's white metal packing, W. REID's patent specialities, RUTHVEN's water propulsion, JOY's valve gear, the BOAZ tube stopper, LESLIE's roller bearings for shafts, BELDAM's packing and pump valves, WHITEL's valve adjuster, MORTON's valve motion, CHURCHILL's governor, also a model of a compound engine fitted with the attachments, &c. Amongst the models of engines, of which there were several, one lent by Messrs. T. SKINNER & Co., was specially worthy of attention, specimens of DEWRANCE's patent safety gauge glass connections, Messrs. CROMPTON & CROMPTON's castings, &c., Asbestos and other patent packings by BELL's Asbestos Company, &c.; also a few fine cases containing specimens of electric light and telegraph wires and other articles manufactured by the Silvertown India Rubber and Gutta Percha Company. Amongst many photographs and engravings worthy of special note, were several lent by the Editor of the *Engineer*, Mr. W. J. CRAIG (manager of the Victoria Graving Dock and pontoons Company), and others. Considerable attention was directed to a very fine microscope and objects exhibited by Mr. SLIGHT, also to several instruments exhibited and explained by Mr. J. McF. Gray, and a fine astronomical model and diagram illustrative of the motions of the earth, sun, and moon, lent by Mr. JESSE NIMKEY, F.R.A.S.

During the evening the Meiter family gave selections of music. Singing and music by members and friends, two recitations by Mr. A. Wieland, reading by Mr. Craig, and a farce entitled "Chiselling," by an amateur party, were rendered, with occasional intervals for conversation, fruit, and refreshments.

After tea, the President, MR. BELDAM, referred to the great importance of engineering in developing the resources and advancing the trade of the world, benefitting the merchant and consumer alike by giving facilities for the rapid and economic manufacture of goods of all kinds on shore, and for their speedy and economic despatch by sea. He was proud to reckon himself an engineer, and he felt it an honour of no mean kind to occupy the position in which he had been placed as President of the Institute of Marine Engineers.

The Honorary Secretary gave a brief and forcible address, in which he referred to several interesting features in connection with the rise and progress of the institute. First, the interest manifested by the ladies in their visits to the reading room on occasional evenings, and in their abiding visit that evening, lending their pleasing features to the many other encouraging proofs that the Institute was progressing in its work, gaining and commanding confidence as it proceeded. Next, the warm and approving sympathy of the Press, exhibiting by many proofs a confidence in the objects and aims, as well as the practical outcome of the labours of the promoters, which he trusted nothing would mar, but that everything done in the future would tend to strengthen and maintain. He exhorted those present to do what they could to induce the junior engineers, and young men coming out as engineers, to join the association. Referring to the many temptations surrounding their opening careers, he urged that they should make the choice between the helps and hindrances to their advancement in life, pointing out in emphatic language that the Institute would prove a most effectual help. Although pressing the claims of membership on the juniors, he mentioned that, however paradoxical it might appear, the numerical gain to the Institute was greater by far than the financial, by the admission of associates and graduates, their payments being small; at the same time the aims and objects of the Institute were far beyond the scope of finance and its calculations. He advocated that every man should study some subject in



his leisure moments, as far removed as possible from his own special business in life, on the principle that one who devoted his whole attention to one subject became too much one-sided, using the analogy of a tree which spread forth its branches to one quarter and withheld them from another, thus lacking symmetry and grace. The tripart nature of man was alluded to, and the necessity of cultivating all the elements which go to make up the character was pressed, especially in the cases of those on the threshold of the business of life as engineers; thus they would maintain the honour of their cloth and attain to the dignity of true manhood.

MR. H. E. LESTER gave an address on the subject of "Honorary membership," and seemed to advocate that it might be well worth the consideration of the Council, whether they should not admit ladies as Honorary Members. It was generally understood that honorary members subscribed to the funds of the Institute according as they felt disposed, and probably ladies might be admitted to the privilege of contributing within a range of £15 to £100 per annum, thus obtaining the dignity which had been conferred on himself. He felt very much in the position of a certain student of divinity, who as his turn came, had to preach a sermon from a subject to be given to him at the time in order to encourage impromptu speech. The subject of Zaccheus was given, and he began his sermon by stating that Zaccheus was a short man, and so was he, Zaccheus was up a tree and so was he, Zaccheus quickly came down and went away, and so should he. MR. LESTER dwelt upon the noble aims and objects of the Institute and its members, and said that in his opinion it was an excellent means provided to all engineers of educating themselves, and of becoming acquainted with the leading members in their own line of life, thus being benefited socially. In closing he hoped that the cherished wishes of the members of the Council would be fulfilled, and that soon the Institute would have a building of its own, as he understood from the honorary secretary that he had some plans and intentions in this direction, having class rooms, model rooms, reading rooms, and probably, he might add, the smoking room would not be forgotten.

Amongst others present where several of the local Aldermen and Councillors, the Rev. Alex and Mrs. Jeffrey, J. Mac F. Gray, and several of the Board of Trade surveyors, Mr. Wilkinson, Lloyd's Surveyor; Capt. Hutchinson, marine

superintendent ; Messrs. T. Auckland, David Joy, J. D. Churchill, A. W. Robertson, W. Reid, W. White, S. C. Sage, the Superintendent and Assistant-Superintendent Engineers of the P. and O. and British India S.N. Companys ; Mr. Crook, Telegraph and Maintenance Company ; Mr. Campbell, New Zealand Shipping Company ; T. Wiltshire, Thames Ironworks Company ; Mr. Hudson, Shire Line, and other Superintendent Engineers ; Messrs. Woodman, *Shipping World* ; J. Neal, *Marine Engineer* ; W. Longstiff, *Newcastle Chronicle* ; J. Johnston, *Fairplay* ; J. C. Whitworth, *Stratford Express* ; Representative, *Iron and Coal Trades' Review* ; and other representatives of the Press, and many well-known and local men.

The proceedings of the evening were brought to a close about 11 o'clock by the Meiter family playing "Auld Lang Syne," and the assembly of ladies and gentlemen was dissolved after spending a most pleasant and sociable evening, a result which ought to be most gratifying to the promoters and well-wishers of the Institute.

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