IT is proposed to notice some of the relative advantages of carrying out public works by the two systems, viz. (a) by large contracts, and (b) departmentally, that is, by the direct agency of the Government Department, municipal council, company or other corporation undertaking the works.

2. Among the advantages of the contract system, supposing the contract to be entered into in a fair, honourable and liberal spirit on both sides under a carefully prepared estimate and specification, may be cited the following:—1st. The corporation is relieved of a great amount of detail work, such as payment and supervision of labour, provision of materials, purchase or hire and repairs of plant, care of works while under construction, fencing, lighting, etc.; not, however, of risks from damage by floods or other uncontrollable accidents, for if it be specified that the contractor is to be responsible for such unforeseen damages he will make allowance for it in his prices.

3. Secondly, the works ought to be done rather more economically, as the contractor would, in most cases, already be in possession of some of the plant, and could use it on several contracts going on at the same time, while, if purchased by the corporation for a particular work, some of it would inevitably from time to time be idle.

4. Thirdly, as regards the engineer, he would be in a great measure free from the interference of the corporation in the management of the work, which would cause loss of time, and from the employment (forced upon him) of unsuitable men, as well as from some necessary and a great deal of unnecessary red tape.

5. Among the disadvantages of the contract system are the following.—The contractor is hampered by a specification and plans which may require modification from time to time, and by general conditions which, in some cases, are inapplicable to the conduct of the work in hand, which alterations and discrepancies cannot be arranged without correspondence with the engineer, often involving considerable delay and sometimes risks to the works, all of which has either been allowed for in the contract prices, or it becomes the subject of a claim for extras afterwards.

6. Again, the contractor has to base his tender on plans and sections and other information, which in many cases must necessarily be incomplete, and the risk assumed by the contractor must either be covered by his prices, if he is not to be a loser if the conditions turn out unfavourable to him, or, if they turn out favourable, he will be overpaid.

7. The advantages to the corporation of carrying out works department-
ally are many. Thus, it only pays for work actually done; it may partly avoid the delay necessary for the preparation of the complete plans and specifications required for a contract by beginning the parts of the works first required before the detail working drawings of the works required last are drawn out, and by carrying on the construction of the former and the detailed designs of the latter simultaneously.

8. Also, if during the course of construction modifications of the design in parts become desirable, they may be made without the trouble of altering the contract and adjusting claims for loss of profit on works contracted for but not carried out, and arranging prices for the substituted works, in which operation the contractor has clearly the advantage.

9. Again, the engineer in charge of the works is more intimately associated with their progress in all their parts when they are carried out departmentally. The staff of subordinate officers, and even the workmen, can be carefully selected, and there is no inducement to scamp work or use inferior materials, things which cannot always be prevented or detected on a contract, even under the most careful inspection.

10. In the above it is assumed that the engineer is fairly treated by his employers, just as in the beginning of these remarks it was assumed that both parties to a contract were actuated by honourable business principles and not by a mutual desire to overreach one another. The engineer must have the entire management of the execution of the works, the selection of overseers and the control of the workmen. When his plans are once approved, he must not be hampered by the imposition of directions in accordance with the fads of individual members of the corporation, or the fancies or fears of a weak or ignorant minister or chairman. When an engineer allows himself to be treated by his employers, as he himself has a right to treat a subordinate officer, he is unworthy of his position, and the departmental system of working would under such a man be at a disadvantage, and would probably break down altogether, and so for that matter might any other system.

11. Another advantage of the Departmental System is that when the execution of the works extends over a considerable time and the supply of the necessary funds fluctuates, the rate at which the work can be carried on can be more easily arranged than when a Contractor is interested in it.

12. Finally, under the Departmental system litigation is avoided, and that is perhaps the greatest evil connected with the Contract system. It might be supposed that under the ideal circumstances attending the making of the contract, which have been assumed above, there need be no litigation, but there will at least be differences of opinion, and honest differences—the minds of the Engineer and the Contractor being insensibly biassed by their respective interests. It is, however, too much to expect in practice that such a favourable state of matters should exist at the making of a contract, and the standard of commercial morality is not at the present day high enough to prevent the feeling between the parties being in most cases one of antagonism and suspicion.

13. The writer is glad to say he has known cases where contracts have been loyally carried out on both sides, but they are fewer in number than those in which on the one hand contractors have endeavoured to shirk their
THE CONTRACT SYSTEM OF CARRYING OUT WORKS. 3

obligations and have made unreasonable claims, or on the other the Corporation have harassed contractors and refused reasonable concessions and allowances. Some parts of extensive works cannot of course be carried out departmentally, and there must be contracts in nearly all cases for the manufacture of iron work, for instance, and for the supply of building and other materials. These remarks do not apply to such contracts, but to the usual kind of large contracts obtaining in these Colonies.

14. The rule of accepting the lowest tender which obtains in this country is, the writer thinks, radically wrong, and it is often productive of a great deal of trouble and cost. It shows, on the part of the proprietors of the work, an inclination, at least, to reduce the profit of the contractor to the lowest limit, and it is a temptation to the contractor to tender at a rate which he knows will leave him no profit, and to trust to making up the loss by claims for extras, or by putting in bad work. This, of course, leads to litigation, and the determination of the matters in dispute is often left to twelve jurymen, of whom, it may be, not one is capable of forming an intelligent opinion on them, and whose verdict may depend on the skill with which the case of one side or the other has been got up, which may easily make the worse appear the better cause. Private companies, or individual owners, can well afford to avoid the evil of accepting, as a matter of course, the lowest tender; but if other corporations exercise the right which they generally reserve to themselves of accepting what they consider the most reasonable tender, their motives are sure to be called in question, and it is natural—though not creditable—to them that they should ignore their duty to choose what they consider likely to be the most advantageous tender in the long run, and should give in to the practice which has become so common—one may almost say the rule—of accepting the lowest tender, and throw the blame of any consequent disasters on the contractor. In some countries the practice is different, that tender being accepted which approximates most nearly either to the engineer's estimate or to the average amount of the tenders. Either plan is certainly much more reasonable than that of accepting the lowest tender simply because it is the lowest.

15. Among the works that may be most advantageously carried out by contract in this country one may probably include buildings and ordinary earth-works on railways or canals, although if deep cutting or tunnels are included difficulties are almost sure to crop up; also some harbour works, dredging, piers, &c. Among those which, in the writer's opinion, should never be done by contract are:—The more difficult and important parts of water-works, such as the foundations and out-let works of most reservoir embankments and weirs (unless they are only on a small scale), the abutments and piers of bridges in difficult ground, and other works to which, in case of defects appearing, access would be difficult or impossible.

16. It may be objected that the departmental system imposes a greater responsibility on the Engineer. This is, however, by no means clear. The Engineer has his duties both to his employers and to the contractor. He is bound to see that the contractor adopts proper methods of working so that due progress may be made and the safety of the works may not be endangered, and he is at least jointly responsible with the contractor that all
reasonable precautions against delay or failure are taken, for it is usually specified that the contractor shall do this, and it is the Engineer's duty to see that it is done. It would seem also that in such parts of a contract as are incapable of being minutely specified, deep cuttings, tunnels, foundations, and the like, the Engineer must direct the work as it goes on, just as he would have to do if the work were to be carried out departmentally.

17. It has been attempted to preclude the possibility of litigation by referring every matter in dispute to the decision of the Engineer, "which shall be final." Now, while it is of course essential that the Engineer shall be the final judge of the quality of the work and of the methods of carrying it out, and as to its being in accordance with the specification, and that in such matters his decision shall not be set aside or modified by the corporation or in any way questioned, there will always be points of dispute on which it would be unjust to the contractor and unfair to the Engineer himself to make him the final referee. He might through inexperience, an error of judgment, or it may be unconscious bias against the contractor, give an unjust decision, and it cannot be that the contractor should have no redress. Therefore, this making of the decision of the Engineer absolutely final in all matters of dispute, especially with respect to alterations, omissions or additions to the contract, differing possibly in kind from the work specified to be done, or such as alter the circumstances, surroundings and conditions of the contract, cannot have the desired effect. A man should not be made the final judge of his own actions or their consequences. [Since this was written I was glad to see that the Melbourne Contractors as a body had endeavoured to get this matter put on a more satisfactory footing.]

18. On the whole, looking back on works carried out, some in one way, some in the other, the writer considers the departmental system the more satisfactory in important works, and the contract system where numerous small works of similar character and less importance are involved.

19. In the foregoing remarks the writer has not touched on the relations of the workmen to any undertaking. These were treated of by Mr. Culcheth in a paper he read some time ago. The writer of the present paper thinks that their relations would not be affected whichever system were adopted, depending, as they do, on the understanding between the men and their immediate employers. For instance, under either system the minimum wage might be enforced, and it would, the writer thinks, equally result in great disadvantage both to the men and the employers.
DISCUSSION ON MR. GORDON'S PAPER.

Mr. Mountain thought that in a general way Mr. Gordon's paper would have the approval of most engineers. There were certain works better done by contract and others which were more satisfactorily performed by day labour. As one who had had the responsible administration of works for many years he preferred work being done by contract. He said this after an experience of 19 years on large and important works. It was better for the engineer to be away from all outside influence. Men he (the engineer) dispensed with were often brought back afterwards through other influences being at work. With regard to the engineer being the sole referee in cases of dispute. That had always been his position. He had small troubles occasionally when settling up the final accounts, and had not heard of any of his contractors complaining of being unjustly dealt with. Arbitration was not always a success, and was generally to the disadvantage of public bodies. If the engineer was fit to be trusted with the designing and superintendence of works amounting to £60,000 or £70,000, was he not to be considered capable of judging as to the small extras? The arbitration clauses in the Public Works contracts were being eliminated and the old order of things reverted to. Arbitrators also might be biased in favour of one side or the other. He agreed that certain works were better performed by day labour than by contract, i.e., certain portions of the City Council's works were of a delicate character and it would not be wise to let them to contractors. Sewerage works in the streets, laying of water mains, were generally done by gangs of day labourers. In Australia most engineers of public bodies would rather call for tenders.

Mr. Turner agreed with Mr. Mountain in his remarks regarding the contract system, providing they could draw up a proper specification. In some works it was not possible to do so; where it was a new piece of work in which the whole beginning and end of the contract could be seen, the contract system was to be preferred. He did not see so much difficulty regarding the extras; generally they were dealt with as they cropped up during the progress of the work. Private firms did not object to the contract system.

Mr. Mountain : The matter should be done in writing at the time. Regarding the lowest tender being accepted; this was an important point, and he failed to see how they could do otherwise, especially with public bodies.

Mr. Gordon did not agree with Mr. Mountain.

Mr. Turner remarked that he once accepted a tender which was not the lowest, and when the lowest tenderer heard of it he complained bitterly about the matter.

Mr. Mountain had found cases where a contractor had tendered at what he (Mr. Mountain) thought was a very low rate; but there were certain
circumstances of which he was not cognisant at the time, which enabled
the contractor to tender very low and yet make a profit. In the case of a
private company select tenders might be invited. He instanced a case of
a builder receiving a commission of 10 per cent., the employer providing
all material, etc.

Mr. Gordon did not concur with Mr. Mountain regarding the arbitra-
tors. The law of arbitration did not allow an arbitrator to act as an
“advocate.”

Mr. Turner thought a single arbitrator would be more satisfactory.

Mr. Mountain remembered a case where an arbitration board awarded a
man about twice as much as he ever expected to get in his most sanguine
moments.

Mr. Gordon said in one case he had to give an award because the two
arbitrators could not possibly agree, and he gave it in favour of the con-
tractor to about 25 per cent. of what the contractor claimed. The contractor
was quite satisfied.

Mr. Hill mentioned that in connection with the sewerage, already 200
estimates were issued in Melbourne, and where the Board’s tender was the
lowest the other tenderers had seen the people interested and arranged for
doing the work at even a less rate.

Professor Kernot trusted that he was not one of the arbitrators referred
to by Mr. Mountain. He was, however, once the chairman of a very
large and important arbitration case (not an engineering matter), in which
gave the people certainly more than they asked, and he still thought
the award quite just. Engineers, contractors and arbitrators were quite
human, and it “is human to err.” Mr. Gordon had set out the advan-
tages and disadvantages of the two systems in a very fair manner.

Re the Acceptance of the Lowest Tender.

That system had been advocated by Mr. Mountain. It was, in his opinion,
the only possible way of dealing with tenders by public bodies, and yet it
led at times to unsatisfactory results. In one case he could call to mind
a contractor of large experience tendered for a work at 60 per cent. below
his (the Professor’s) estimate, and the contractor was almost ruined, and
there was no satisfaction in doing it. The subject was beset by difficulties.
A man might tender at an extraordinarily low rate and yet make a profit.
For instance, he might have the whole thing wanted on hand, or, perhaps,
a large stock of material just suited for the work. It was a great thing
to deal with people of repute in such matters, especially in house build-
ing—a man who has a little reserve to draw upon, and who is not on the
verge of insolvency. Contractors should be made produce references of
respectability, etc. As to large dams for reservoirs, and especially difficult
foundations, not being let by contract, he remembered some large dams
(of which Mr. Gordon had charge) which were made by contract, and he
was not aware of any complaints concerning them. There was not the
slightest suspicion of anything being wrong with the foundations.

Mr. Gordon: The outlet was rotten but the body of the dam was good.

Prof. Kernot (continuing) The great Prospect Reservoir in Sydney was
made by contract. With regard to the engineer being the sole arbiter in
cases of dispute. There seemed to be some difference of opinion regarding that. The engineer was, after all, only human and sometimes made a mistake. In one arbitration case in which he was chairman only, the dispute was:—The work had fractured in certain places and the engineer said it was the contractor's "bad work," whilst the contractor said it was the "bad design" and the arbitrators unanimously decided that it was the bad design. That engineer was a man of very high standing. If he had been the sole referee in that case, might there not have been some injustice?

Mr. Mountain: If he had any doubts he might have obtained an opinion from a competent private authority.

Prof. Kernot: If he did so it would be all right. He was inclined to side with Mr. Gordon in this matter. In another case he (the Professor) did not certainly sympathise with the contractor. The contractor had been paid a certain sum and wanted an additional amount. The matter was referred to him as sole arbitrator, and he found that the contractor had been paid more than he should have been, he still thought his decision was correct. With respect to counsel in engineering disputes, he agreed with Mr. Gordon. An engineering matter required engineers to settle it, and persons who had not received an engineering training were of no use. They were like the soldier who did not know how to march and of course threw the others into confusion. Much time was lost by counsel in extracting technical evidence from witnesses. On a purely scientific matter it took counsel 24 days to get evidence out of him that would have been given in 2 hours to people who could have understood it; and the cost of doing so was £400 (payments to arbitrators, counsel, &c.) (Mr. Mountain—The case is not over yet.) In many matters counsel were absolutely necessary, but in purely engineering questions they were only in the way. This was a very important subject and should be exhaustively discussed, and he was sorry there were not more members of the Institute present to consider it. As men were only men and not angels there would always be trouble. The great thing was to get gentlemen of clear heads and tact, and sound judgment for arbitrators, &c.
DISCUSSION ON DEPARTMENTAL AND CONTACT WORK.

AT A MEETING HELD 13TH JULY, 1898.

Mr. W. R. Rennick:—It appears to me that Mr. Gordon has assumed in his paper that the contractor has the plant. I would like to know his views on the assumption that the Corporation has the plant.

Mr. Gordon:—The contractor having the plant is referred to in the paper as one of the advantages of the Contract system, (Paragraph 3). If the Corporation has continuous work going on, then the Departmental would be the better of the two systems.

Mr. A. C. Mountain:—Theoretically speaking, Mr. Gordon’s views appear to be perfectly reasonable, but unfortunately, in carrying out contracts, we have to deal with actual practice. The practical advantages of the Tender System more than compensate for its disadvantages, re the acceptance of the lowest tender, &c. The whole question is summed up in “policy and expediency.” A great deal of annoyance and difficulty to the engineers is averted by submitting work to public competition.

Mr. W. Wilson:—I quite agree with Mr Mountain’s remarks. I have had some years’ experience of both systems, and on the whole I would prefer the contract system where possible. Where day labour is employed, influence is often brought to bear on the engineers; and men whom he discharges for incompetency, etc., are frequently sent back to him. In small works I have found day labour more satisfactory than the contract system.

Professor Kernot: A man of wealth and good reputation might submit a very low tender for the sake of an advertisement; or, it is possible, he may have some means of getting material which the engineer does not know of. Re the pumping engine at Spottiswoode, Messrs. Thompson and Co. were £50,000 lower than the next tender, yet they have not gone insolvent, and they are now one of the most prosperous engineering firms in the colony. A man may have the necessary raw material in hand for which he had no particular use, etc. When dealing with a public body the lowest tender must be accepted. If it were not, the lowest tenderer would make considerable trouble about it.

Mr. Mountain: You must do it. On one occasion a committee accepted a certain tender against my recommendation, and I was astonished afterwards to find that the man did the work well at the price he had tendered at. An engineer must always be “above suspicion.”

Mr. Arnot: For straight-out jobs I prefer the work being done by contract, but with alterations to machinery, involving interference with work on hand, I think the work should be done by day labour. Re the acceptance of the lowest tender. The practice obtaining in England to a certain extent of six or twelve firms being invited to tender is a good one,
and the lowest tender in those cases is always accepted. The engineer should have the sole charge of putting on or discharging men. The
"Government stroke" seems to me to prevail somewhat on municipal
work done by day labour.

Mr. W. R. Rennick: The Railway Department is at present doing a
lot of regrading work by day labour (regrading) which could not be safely
entrusted to a contractor. In general, if the proposed works are straight-
forward, and a reasonably safe estimate of cost can be made, I think it
would be better done by contract, but if the amount involved is uncertain
the day labour system is preferable. On regrading work there is little
"Government stroke." The spirit of competition amongst the various
Inspectors in charge is too keen—each man trying to show that he can
get his work done cheaper than the others. If the corporation has very
large works to execute, all of similar class, extending over years, and
requiring a lot of plant, I think it could do it on the whole cheaper than
by calling for tenders, and certainly with better results, especially if
different officers are put in charge in competition with one another.

Mr. Gordon in reply:—The greater number of members appear to be
in favour of the contract system. It is admitted that certain work can
be better done by day labour, and vice versa. In my paper I sketched
my experiences of both systems during 15 years. The objection mentioned
against the Departmental system are chiefly annoyance to engineers,
through men being put on again, etc., and I think a great deal depends
on the engineer himself. The "batty gang" system seems to work well
in some cases. The system of offering work to a few well-known firms
is an excellent one, if the work to be done is important. I am not in
favour of always accepting the lowest tender. In one instance this was
done against my recommendation, and in the end the work cost as much
as if the next highest tender had been accepted. In my opinion a great
deal of work now done by contract could be done equally cheaply by the
Department by day labour and much litigation thereby avoided.
Author/s:
Gordon, G.

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