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# Compensation of Engineers and Architects

By MR. CHARLES WHITING BAKER \*

Mr. President and Gentlemen of the Association:

Like Mr. Beahan, I went to church last Sunday. You heard his address last night, and he told you how he sat near a pillar. I did not sit near a pillar because I had to pass the plate. It reminds me of a story of one of our good deacons who is a real wag in his way, and he said one day, "I got so little in the plate today I was almost ashamed to take anything out of it." (Laughter.)

When a preacher wants to impress his audience with his sermon, he tries to get a good text to fit his subject. As I was sitting in church I tried to think of a good text that would fit the situation I am to discuss with you, and this text occurred to me, "From him who hath not there shall be taken away even that which he hath."

When the minister gives out his text sometimes you do not see its application until he is well along with the sermon. So we will postpone the application of this text now, and turn to some things in which you all are interested, with reference to what is known as the Engineering Council.

Engineers all over the country have for a good many years been saying that there ought to be some way by which the united voice of the profession could make itself heard. Things are coming up all the time where the interests of the public are concerned, and where the interests of the engineers are concerned, and there has been a lack of any voice by which the united opinion of engineers could be effectively expressed.

Some of those things concern primarily the interest of the engineer himself. Some of those things relate to matters where sound engineering principles are at stake and the public welfare is at stake. In the long run those also concern the engineer himself, because only as we can get engineering work done economically and efficiently, will we put engineering and the engineer where they ought to be on the map.

The problem was how to get some organization representing existing groups of engineers which could function effectively.

I happened to be brought in as a member of the first organization which attempted to do that. You know the four great National Societies of Civil, Mechanical, Mining, and Electrical Engineers have headquarters in New York in the great building Andrew Carnegie gave to them. The Civils only came in a few years ago, but the rest of us have been together for fifteen years now.

These four National Societies with one or two others organized seven or eight years ago, a joint conference committee of Engineering Societies, and that committee tried to do some effective work. But when you deal with an engineering organization you find they are very careful how they give authority to anybody to act for them. Our Joint

Conference Committee had this much authority. If we found something that needed to be done we could go back to each Society and say, "Have we your permission to go ahead and do this?"

That was a very slow process. Matters are all the time coming up which concern the engineering profession and the public, and if you have to go thru that slow process you find when you are ready for work that the opportunity has passed.

To explain the machinery further, I want you to understand how slow it is to get formal action by these National Engineering Societies. They are each governed by a Board which meets perhaps three or four times a year. They have executive committees which meet in the interim occasionally to take up things of immediate importance, but they generally tie up the Committee so that it cannot do very much.

We, that old Committee, did a few things. For example—when the San Francisco engineers wanted to properly celebrate the engineering features in connection with the International Exposition of 1915, that Committee formulated a plan for holding a National Engineering Congress and succeeded in having that plan backed by the leading engineering societies so that it was put across.

In general, however, we found ourselves so tied that we could not do effective work, and the Committee became dormant. But all the time the demand was increasing for somebody able to speak with authority for the engineering profession. Our Committee met and said, "Perhaps now the societies will give us a little more authority." Suppose we draft a by-law which will allow us to go ahead with any matter that needs prompt action, provided we report at once to each of our societies what we have done?" We asked our societies to approve that by-law, and two or three of the societies, in rather a perfunctory way, did approve it. So our Joint Conference Committee thought we might go ahead and do something under that basis.

About that time there was great agitation over the water power situation. There were hundreds, if not thousands, of engineers who found their occupation gone for the time being because of the deadlock over the water power situation, the lack of any authority in the nation that would allow the development of unused water power on navigable rivers in the far West. Our Joint Conference Committee said: "That is a subject to which nobody can raise any objection. It concerns the electrical engineer who designs and installs the transmission lines; it concerns the mechanical engineer who makes the machinery for such power plants; it concerns the civil engineers who want to build such plants; it concerns the mining engineers who want to use that power in mines." So we adopted a resolution in a very non-commit-

(\*) See editorial,

tal form which merely urged that the Government should unlock these natural resources and allow them to be utilized. Now it does no good to adopt a resolution unless someone sees it, so we gave the resolution what publicity we could. We sent it to the President of the United States, and we let it be known that we sent it.

A that time, however, some people were very leery on water power propositions and very much afraid "the big interests" were trying to put something over on Uncle Sam, so we began to hear protests. What business has this Committee which very few engineers had ever heard of, to commit the engineers of the country to any such proposition? And the governing bodies of some of the National Societies woke up and said, "Why, what are you fellows doing? What authority have you to commit us on this?" I had to go before my own council and talk "turkey" to them.

I mention this incident to show you the difficulty that you have to face when you attempt to do things as a representative of other societies. You are facing it in this organization here. If you are doing things worth while, you must have authority from these societies back of you to go ahead. Then you must give authority to your own officials to go ahead using their best judgment. If any organization like this is to do worth while work, you must trust somebody to use his judgment and to do promptly, the thing that is necessary to be done. In other words, you must have a representative government instead of a pure democracy.

Well, after that experience and two or three other minor events, it was very evident that the old Joint Conference Committee of Engineering Societies had too long a name and too confined powers to accomplish anything. We then began to talk about what we could do to put engineering on the map and accomplish things we all saw ought to be done.

Some of the hustling, forward-looking men in the governing boards of the different societies began to hold meetings and compare notes to see what sort of organization they could devise that would function properly. Meetings were held at intervals for three to six months and various schemes were discussed. We had to be exceedingly careful how we trod on the toes of this society or that society or the other society.

It was after those months of travail that the Engineering Council was finally born. The societies finally gave up a charter which said that we could go ahead and do the things we found necessary to be done where the public interest was concerned and where the engineer should have an opportunity to express his voice. They tied us up however much more tightly than some of us believed best. There is a provision for example that a majority of the representatives from any one society can put a veto on the proceedings. At the start also it was made very difficult to admit other than the four "Founder" societies to the Council. Some of us on the Council who try to be a little progressive have been working on plans so that other societies could have representatives. We have opened the door to the American Society

for Testing Materials, and we have invited another society to come in.

I want to impress upon you most emphatically, however, while the Engineering Council is now made up of representatives of five Notional Societies, *it truly represents and is working for the engineering profession as a whole*. I happen to be a representative from the American Society of Mechanical Engineers, but in doing work on the Council, I am not working for the interests of that particular society or of the Mechanical Engineers branch of the profession, but for the interests of the engineering profession as a whole.

There is a popular idea, I believe, that the men who belong to the so-called "founder" societies are the men of advanced attainments in the profession, and that they no longer have any interest in the welfare of the men in the lower ranks of the profession. This is a huge mistake. The Council is for the interest of the profession as a whole. The Engineering Council *is your* council just as much as if your representative were sitting on the Council. We are just as much concerned in the welfare of the people, and the engineers of Ohio, as we are in that of any other State.

And that leads me to call your attention to another thing—the limitations of what the Council can do. There is a tendency among engineering societies to say, "Why don't the Council do this; why don't they do that?" I want to call your attention to the fact that there are pretty strict limitations on what the Council can reasonably undertake. It has developed that the functions of the Engineering Council must be generally confined to National affairs. We could not attempt, and it would be a mistake if we did attempt, to express opinions or try to exert our influence in the affairs of individual cities where engineering matters are concerned, or in the affairs of individual States.

There have been, it is true, cases where the Council has taken action in local matters. In New York, the Engineering Council has acted in certain cases because there was no other body of organized engineers to take action.

You can very readily see however, with forty-eight States in the Nation, if we attempt to centralize control over State matters in one city of the country, as New York, Chicago, St. Louis or Washington, it could not be done. So you were on the right track, gentlemen, in organizing and making a real force out of this Ohio Association of Technical Societies. I said years ago in the Engineering News, that every State in the Union ought to have an efficient, well-organized, State Engineering department. It would not be an exaggeration to say that tens of millions if not hundreds of millions of dollars, are lost in this country annually because of the general lack of properly organized State engineering departments. That is the sort of work that such an organization as yours should undertake, and which you may well look forward to.

For instance, I do not know what your laws are here, but I am probably not far mistaken when I say that the time is not far distant when you

will have to have State control of your potable water supplies. Some of the states further east have already been forced to that. That is a question in which you engineers should have a say, because it does not do to trust that work to lawyers. They have not sufficient information about technical matters to successfully undertake such legislation without the advice of competent engineers. It is a great help if an engineer who knows the situation can go before the Legislature and say, "I come representing the Associated Engineers of the State." It has a great influence with law-makers to have a man come with such authority.

So also, with municipal matters. The Engineering Council, *your* Engineering Council, has the greatest interest in the development of the local engineering societies. I think that everyone who has studied thoroughly engineering organizations believes that the local engineering society has a field of the very greatest usefulness, that it can best fulfill this important function of helping out in local matters where the engineer and the public welfare are concerned. So the Council is holding out its hands for cooperation with any engineering society which is doing things that we want to see done.

Further than this, the Council is not attempting to do the work that should be done by the individual National societies. There was an idea afloat when the Council was being born that the Council wanted to do all sorts of things and arrogate larger powers to itself. As a matter of fact the Council does not want to do anything that is not clearly within its function. There are many things that the individual National Society can properly do where the interests of its branch of the profession are concerned, very much better than Council can do them. The Council's opportunity for action comes where there is need for the engineering profession as a whole to exert its influence.

I have alluded to some of the work which the Council has done in local matters. One very interesting situation arose in New York last January, where the Council stepped in at a moment's notice when there was not time even to call a meeting of the whole Council. We had to call together the Executive Committee, and do some rapid fire work. New York is building a system of rapid transit that is the largest engineering work in the world. As large in total outlay as the Panama Canal. It has a great engineering staff that has been developed through the course of years, with a capable engineer at the head, and with a very esprit de corps. It came to pass in the course of human events or inhuman events, that on January 2 last, the engineers who reported for work on that rapid transit construction, about 300 in number, were informed that there was no money to pay them, that the Board of Estimate and Apportionment, which handles the money-bags in New York, had failed to make any appropriation for the work. If the engineers chose to work, that was their affair. They could not expect to get any pay for the work unless something

should happen later on. The men at the head, the Chief Engineer, and the Rapid Transit Commissioner, were absolutely helpless. They could do nothing. There were men who had just come back from their Christmas holidays; there were men who in the interests of the work had forfeited the holidays to which they had been entitled last summer; there were men back from trips to their homes, to find that they had no jobs. They were thrown out of work at a time when engineers all over the country were looking for positions. It was a very serious matter for these men. It was an act that no private employer would be guilty of. For the great city of New York to give that sort of Happy New Year greeting to its faithful servants, was a disgrace beyond the power of words to express.

The few members of the Council who could get together decided that the best way to reach the matter was to hold a public hearing. We invited to that hearing the Public Service Commission, which has charge of the Rapid Transit construction; the City officials, from the Mayor down; the engineers who had been the victims of this treatment. We had also representatives from the labor organizations representing the men who were working on that rapid transit construction, who told us in very plain terms that their lives were at stake if these engineers were discharged. Many of these engineers immediately took other positions—declared in emphatic terms that they were through with working for the City of New York—this walking delegate put before us in very plain terms the extent to which the lives and limbs of the men in his Union were at stake because of this treatment of the engineers.

Then we used publicity to bring the matter before those in authority. The Governor of the State stepped in and after a week or so, they did reinstate those engineers. We did not do all we would have liked to have done but at least in that emergency the engineers had someone to speak for them.

The Engineering Council was organized about the time the United States entered the War. For nearly two years its work was largely centered on war activities. We as engineers, like all the rest of the profession, believed that the best thing we could do for the profession was to do the patriotic thing. We bent all our energies to doing anything we could that would help in the prosecution of the war.

There is a rather interesting story which shows some of the things that came before the Council at that time. All sorts of propositions were put up to us. We had a Committee which worked on the examination of inventions that might be of value to the Government. One of the prominent engineers who was in Washington came before the Council one day to say that one of the very highest officials of the Government wanted to get our opinion on a scheme that they were considering and desired to see whether it was practical for stopping the depredations of the German submarines. They had worked out a scheme for building a huge wire rope net-work fence across the North

Sea. They planned to put a net-work of wire cables, all the way across the North Sea, deep enough so that a torpedo boat could not dive under it and with a mesh small enough that it could not get through it. You can imagine what that would involve. I just instance that to illustrate some of the things brought to us in those war days. Afterwards the Navy did work out a fence there, composed of wire cables, from which mines were suspended, that did practically stop the movement of the submarines out of the North Sea.

After the Armistice was signed it became time to look about us to see what functions the Council should now undertake. The work of reconstruction naturally came to the fore, and almost the first thing that came before us, was meeting the needs of hundreds of thousands of engineers who were mustered out of the service and were looking for positions. The Council then undertook the organization of an employment bureau to which any engineer could go and make application and any employer of engineers could go to that Bureau and find where there were engineers available to meet his requirements. That is a work that some of the individual societies have been carrying on very efficiently for a number of years for their own members but they were willing to pool their activities and so we have organized this Engineers Employment Bureau. As showing that we are working for the whole profession and not for the four Founder Societies alone, I will tell you that the service of the Bureau is free to any engineer whether he is a member of the National Engineering Society or any other engineering society, or none.

Among other matters presented to us was the condition of the individual engineer as regards compensation. One of the early things we did was to appoint a committee which has been working since then on the proposed registration or licensing by state law, of engineers. After we had organized this committee, the suggestion came that we might go further. It came in the form of pressing requests from some sections of the engineering profession. The railway engineers were the first to come forward. There was a Board on Railway Wages and Working Conditions sitting at Washington, passing upon the requests of various groups of railway employes for increased compensation. Who was there to speak for the engineers? The urgent appeal came that we should undertake to represent the Railway Engineers in their appeal for better compensation. So we undertook to answer that appeal and had representation at these hearings.

But partly as a result of our work there, we were led a step further. Why should not the engineer himself determine what is a fair compensation for him to receive? He is better qualified to do that than the employer, especially when the employer is a public body. He knows what technical work is. He should know something as to what is a fair compensation for technical work. Why should there not be a standard rate of compensation for engineering service? Last February that work began.

I noticed when I saw the printed program for this meeting, it said that I was a member of the Engineering Committee on Compensation, which committee had been collecting and compiling data for *several years* on this subject.

If that were true, that we had been working for several years on that subject, I say frankly I would have been ashamed to come here, because this is a matter where "time is of the essence of the contract." The work only began last February. At a meeting of the Council on February 20, the Committee on Public Affairs, of which I am chairman, reported to the Council that it was time we did something on this matter of engineers' compensation and recommended that we should appoint a committee on it. The Council gave it their hearty approval and told us to go ahead.

It is a big task that we have undertaken. It is a stupendous task. The wonder to me is that we have been able to accomplish as much as we have. We have organized that Committee in three sections. One section has to do with the Federal Government engineers. Another section has to do with engineers in State and City Service. The third section has to do with engineers in Railway service. It is these three classes of engineers who are to the best of my knowledge and belief in the worst situation as regards compensation of any engineers in the profession. As far as the Mechanical Engineers are concerned, the engineers engaged in manufacturing have been prosperous. I think many, if not most of those engineers, have very little to complain of. It is really the Civil Engineers who have suffered worst during the war and since the war from inadequate compensation.

And that illustrates, I think, the solidarity of the engineering profession. The Council is concerned about this although we do represent mechanical, electrical and mining as well as civil engineers, and properly so, because in the long run we cannot have any large section of the engineering profession inadequately compensated without its having an influence on the compensation of all engineers.

I was speaking of some of the difficulties which are involved in this work. One difficulty is that of functioning Nationally. The members of our section on Municipal and State Engineers, for instance, are the assistant chief engineer of the Board of Estimate and Apportionment of New York City, the city engineer of Minneapolis and the city engineer of San Francisco. Of course they cannot travel clear across the continent to hold committee meetings. They have to consult by correspondence. It does make very great delay, as you can see, to act as a committee and have the members who are farthest away really able to take part in important actions. Very properly, the Committee is putting the largest part of the responsibility on its chairman, Mr. Tuttle of New York. That committee has done a heroic amount of work.

I want to say in this connection, to digress a little bit, as showing something of the economy that the Engineering Council is exercising in its

expenditures that the entire expense of this committee has thus far been met by the members themselves and they have not called on the Council for any funds whatsoever. That is the way much of the Council work is being done—by the self-sacrificing devotion of men who have the interests of the profession at heart.

I told you at the outset of the Scripture text which I believe well applies to the situation of many Civil Engineers, because of the increase in the cost of living that has taken place since 1914. That is a subject which all of us have run up against, but is not yet as fully understood as it should be. I have had occasion to study it quite exhaustively in connection with the work of this committee and other tasks in which I am engaged.

A great part of the economic and social difficulties under which we labor today are due to the fact that the public has not yet come to fully appreciate the fact that the dollar is not a fixed standard of value at all. We cannot get it out of our minds that the dollar is not like a foot rule or a yard measure or a pound weight, a fixed standard of value. It is only the experiences of the last two or three years that have finally brought home to the generality of men the idea that the dollar is a varying standard of value.

There is a common idea prevalent that the dollar has only varied in value since the war began, that it was stable before. As a matter of fact the dollar has been varying in value for many years.

Now, there are a good many statistics afloat regarding the so-called increase in cost of living that will not bear careful analysis. In the work I have been doing on this question, I have been careful to take my information from sources entirely unprejudiced. The best authority I know of for the change in the value of the dollar are the commercial agencies. R. G. Dunn & Company have been for more than a half a century collecting and publishing what are known as index numbers which are a true index of the purchasing power of a dollar in the wholesale markets. These index numbers are made up as follows: They take the current market quotations of standard commodities, some three hundred in number, and weigh them according to the average amount of those standard commodities that is used per capita. That gives you an index of the average market prices and what a dollar will buy.

We all know, if we stop to think of it, that a dollar is of no use except for its purchasing power. Nobody wants a dollar except the miser. What one wants is the flour or clothing or coal and so on, that a dollar will buy. The change in average market prices therefore given an accurate index of the change in the value of the dollar.

It may interest you to see what some of the changes have been in the value of a dollar.

The low point of prices or highest value of the dollar since the Civil War, was on July 1st, 1897. Dun's index number at that date was \$72.45. That meant the buying value of the dollar was 1382. There came a revival in business after the depression of the nineties, and by 1902 the index num-

ber had risen to \$101.58, and the buying value of the dollar had fallen to 984. For three or four years prices were about stationary, and from 1906 to 1908 there was a change. The index number on January 1, 1908, had risen to \$113.28; the buying power of the dollar had fallen to 883. By 1910 there was a further increase; the index number had risen to \$123.43; the buying power of a dollar had fallen to 810. There were quite material variations up and down, but there was no further substantial increase until about the middle of 1915.

During the latter part of 1914 and the early part of 1915, after the war began, there was the worst paralysis of industry and the greatest amount of unemployment this country has ever known. Nobody—financiers, economists or business men—had any foresight of what was coming. People were afraid to buy anything. The New York Stock Exchange closed when war broke out. A broker friend of mine told me that there were tens of thousands of shares of New York Central stock to be shoved on the market at fifty if the exchange had not closed. Nobody had any idea what values were to be. Of course that cut down and kept down prices. It was not until the great foreign government contracts for supplies came in that a sudden revival of industry occurred in the summer of 1915, and prices began a material increase.

On January 1, 1915, prices were still on the average just about where they were in 1910. On January 1, 1916, there had been a considerable rise. Dun's index number was \$137.66. A year later it has increased to \$169.56. On April 1, 1917, just before our declaration of war, it had risen to \$190.00. On May 1 it reached \$208.00. On August 1 it went to \$218.00, and continued at about that through 1917 and 1918, until the high water mark was reached on October 1, 1918, just before the Armistice, when it reached \$233.22. That was the average market price as against 1897, when it was only \$72.45. In other words, the buying power of the dollar had decreased to about one-third of what it was in 1897.

Well, everybody said after the Armistice, "of course, prices are going to fall now." They did not fall, however. They went down temporarily for a few months—not far. Then they began to rise again. The high point was reached on August 1, when Dun's index was \$241.65. By September there was a slight decrease but only to \$238.34 on September 1.

But there are other items which enter into the cost of living which are not included in these prices of commodities. For instance, the matter of house rent comes in, and rent lagged behind the price changes in food, clothing and metals. The statisticians of the United States Bureau of Labor, have made out tables, showing the percentage that the average workingman's family spends for food and for clothing and for other things, and rent is the main thing that is not represented in the prices that R. G. Dun & Company include in their index number.

I secured these figures from the Department of Labor at Washington ten days ago. They show

that the cost of living in 18 industrial cities of the country increased by certain percentages in the period from December, 1914, to June, 1919, as follows:

Portland, Maine—74.25 per cent.  
 Boston, Massachusetts—72.78 per cent.  
 New York City—79.22 per cent.  
 Philadelphia—76.21 per cent.  
 Baltimore—83.99 per cent.  
 Norfolk—87.05 per cent.  
 Savannah—79.76 per cent.  
 Jacksonville—77.48 per cent.  
 Mobile—76.64 per cent.  
 Houston—80.22 per cent.  
 Portland, Oregon—69.16 per cent.  
 Seattle—74.01 per cent.  
 Los Angeles—65.07 per cent.  
 San Francisco—65.58 per cent.  
 Chicago—74.47 per cent.  
 Detroit—84.36 per cent.  
 Cleveland—77.23 per cent.  
 Buffalo—84.23 per cent.

I remarked to you a moment ago that the cost of living, according to Dun's statistics of the wholesale prices of commodities reached its high point on August 1. Now, as a matter of fact, the cost of living has gone up very noticeably since that time, because October 1 saw a great increase in rents. They were in many cities held down during the war, but all over the country, as you know, there has been a great influx of people looking for houses, and rents everywhere have gone up. That is why the cost of living at the present time is higher even than in August and September.

Now, gentlemen, I can say, I think, with little fear of contradiction, that in the year 1914, the average civil engineer was not getting any more than a fair compensation for his work. Many of us believe he was not getting as much then as his work was fairly worth—what he ought to receive for the value rendered by him to the community. He is paid in dollars, and if he is paid in dollars that are not worth as much as they were in 1914, his pay has come down just as surely as if he had received notice that his salary would be reduced; because the dollars are worth to him only what he can buy with them.

The members of the labor unions as you know, have taken action to secure an increase in their wages to offset the increased cost of living, and in going over these figures I am forced to the conclusion that you and I have been "cussing out" the union man perhaps more than he deserves—because the figures show that a lot of these trades have not yet received an increase in wages sufficient to offset the increase in the cost of living. On the other hand, there are other trades where the workers have had more than this. There are cases on record in the Bureau of Labor where workmen in ship building concerns have had their wages shoved up way beyond the increased cost of living. But the engineer and the salaried man in almost all occupations has generally not had a square deal. Now we cannot have a surer basis on which to build a propaganda for giving the

engineer something like what he deserves, than to make the plain statement that he is entitled to at least the same amount of compensation, measured on an absolute standard of value, that he was in 1914.

Did you ever think how it would help our understanding of these matters if we did have an unchanging standard of value—if, instead of measuring prices by the dollar, which like a rubber band, constantly stretching and shortening—we could measure prices by a standard which, like the yard stick, would remain constant? Your street car fares here and everywhere instead of remaining stationary, as we all unconsciously suppose, have been practically cut in two. The nickel, as they tell us, is worth only half as much as it was ten years ago. The street car employes are entitled to an increase in wage to offset the reduced buying power of the dollar. The street car company has to buy at the market price its steel and coal and other supplies, and that is why the street car companies of the country are on the rocks financially.

That is why the steam railways too are in a very bad situation. We say that the railways have 25% increase in freight rates and 50% increase in passenger rates and the Government has done a lot for them by grants and increases. Why don't they make money? They have not made money because of the declining value of the dollar.

Now, to return to the work of our committee on the Compensation of Engineers. The first thing that committee had to do was to find out what the present situation is. Each of the separate sections of the committees sent out inquiries to find out what pay the engineers were receiving now. I have in my hand some advance figures which Mr. Tuttle, the chairman of the section on State and City engineering employes, has obtained. He has received returns from the engineering service of sixteen cities, the population of which ranges all the way from fifty thousand to six million. They represent a total of 1672 engineers and other technical employes. He also has returns from the State engineers of four states, representing 110 employes, and from the State Highway Engineers of five states, representing 169 employes. He asked each of these to report what increases in compensation had been granted to their men since July 1, 1915, to July 1, 1919, and you will be interested to hear what these figures are.

I have just given you figures showing the increase in cost of living, and you can compare those figures, varying all the way from 65 per cent or so on the Pacific coast, to 84 per cent on the Atlantic coast, with figures showing what the engineers in the public service of the states and cities have received.

In the State engineering service they have received on the average 23 per cent increase in compensation since 1915. The question was also asked from those who made the returns what additional increase was recommended, and the average of those recommendations is 27 per cent additional increase, or 50 per cent, which you can still see



would leave the engineer not nearly as well off as he was in 1915.

State highway engineers have not fared as well as that. The average increase in compensation of those state highway engineers in those four years has been 15 per cent. The heads of departments recommend that they should have an additional increase of 35 per cent, which would bring them also to a total of 50 per cent.

In sixteen cities reported, representing 1672 engineering employes, the average increase in compensation has been in those four years, 18 per cent. The city authorities are not quite as liberal. They recommend an additional increase of 19 per cent, which would give the engineers a total increase of about 40 per cent, if they get it, which you see would still leave them very deeply in the soup, compared to what they were in 1914. And, I regret to have to say, gentlemen, as a patriotic American citizen, that the worst employer in the United States is our dear Uncle Sam. That is one of the things we hope to remedy by the movement Mr. Leighton told you about yesterday at the afternoon session. That is one of the things we look forward to. But there is so much red tape, so much precedent, and the thing is governed so much by law and custom, that it has been very, very difficult for the engineer in Government service to get a square deal or anything like a square deal. Mr. Hoyt, the chairman of the section of our committee dealing with Government engineers, has received information regarding the condition of 3956 employes of Uncle Sam in engineering and technical work. These are classified—I have not referred to that—they are classified according to the standard classification that this committee has adopted.

I may say that that is a very necessary function of course, that we have to perform. We attempted to see whether we could not get a standard grading with a view to organizing the engineering service, and we seem to have succeeded fairly well. There are in our original scheme eight different grades. The first grade is the chief administrative officer having full charge of the organization, including the determination of policy, that is, the head of a bureau. Then the next division is the chief of a major subdivision in responsible charge of a large unit.

And then it comes down to the seventh grade, who is an employe on subordinate duty, not requiring special education, training or original knowledge.

The figures for the various grades in the government service show that fifteen of the heads of bureaus have received an average increase since 1914 of 3.1 per cent.

Incidentally, I may remark, as showing the practical way in which Federal control of railways has worked out, that, while they did increase the subordinate employes in the Federal railway service, they at the same time cut down—cut down the salaries of some of the chief engineers. Now, I happen to know personally quite a number of the chief engineers of our railroads, and a more devoted and able set of men I do not know where you would find in the profession.

The chief engineer of a railway does not have any chance to rust out, I can tell you. He earns the money he gets. I do not believe there are any who got any more than a fair salary in the year 1914; and yet the administration in its wisdom—if you call it wisdom—saw fit to cut down the compensation those men received.

A sentiment I have heard expressed among the younger engineers, wondering why they should pay such a man five thousand dollars or ten thousand dollars, when he is only getting twelve, fifteen or eighteen hundred or two thousand dollars. Now, the fact is it is going to be easier—a good deal easier—to pay the subordinate engineering employes something like they ought to receive if we shove up the salaries of the men who are doing the real, big, responsible work, to where they ought to be.

But to return to my story of the Government engineers. Chiefs of minor subdivisions, 846 in number, their present pay per annum on the average is \$2275.00; the maximum is \$4500.00 and the minimum is \$1020.00. That is the pay of a chief of a minor subdivision in the Government service. Uncle Sam would not pay his ash handlers at that rate, because he could not get them.

The average increase in salary since 1915, of the chiefs of the major subdivisions was five per cent, of the intermediate subdivisions ten per cent.

Then come two grades where the bulk of the engineering employes are, 1353 in grade five and 1092 in grade six. They have had increases ranging from 12 to 13 per cent. Thus the average increase in the total is not over ten per cent since 1915.

Those figures speak for themselves, gentlemen, as to the injustice which the great Government of the United States is doing to a very deserving, very faithful class of men.

Now, a little further. In getting this information, we received the recommendations of the heads of departments as to the further increases that should be made. We are going to follow that up now by getting statistics from private employers, people who are working on a competitive basis, who have to pay their engineers on the basis of what they can earn. We know that manufacturers who are employing engineers are paying them very much nearer a fair salary than the great Government of the United States. We propose to show what the private employers are paying to engineers. We think we can make a very strong showing there.

This committee was appointed at a fortunate time. There has been established by Congress, what is called the Keating Committee, a committee made up of the members of Congress which is charged with the duty of investigating the pay of Government employes and seeing what Uncle Sam ought to do to give them a square deal. This committee is working hand in hand with the Washington section of our committee. When I was in Washington last, ten days ago, arrangements were made to appoint a special committee to aid that Keating Commission in getting at the facts of the case regarding the salaries paid to engineering



employes by private firms. I just want to give you that explanation to show that we are functioning and notwithstanding all the difficulties we have to contend with, of voluntary work, we are getting somewhere and are going to do something, at least to try and better his condition.

The members of the committee asked me to prepare something in the way of a report to the General Committee as to the basis on which an engineer's salary should be fixed, which we can take up at our next meeting and discuss and see whether we can come to an agreement on it. I have prepared something of that sort, which I am going to read to you and see how it impresses you. We want fair criticism, and I shall be very glad to talk this thing over with you and see how it impresses you as a means of establishing the profession on a proper basis.

### STANDARD SALARIES FOR ENGINEERING SERVICE.

In attempting to fix standard salaries for engineering service, the endeavor should be to give the engineer just compensation for the service which he renders. If the scale of pay is fixed too high, however, the standard will be ignored, and the profession will lose the benefit it would otherwise have gained. It is necessary therefore, to study the causes which affect the rate of pay of engineers.

The ideal sometimes held up, is that the engineer should be paid what his services are worth, or in proportion to the benefit which the client or the community gains from the service. It is said, for example, that a sanitary engineer's work should be valued in proportion to the lives he saves or an industrial engineer by the economics his systematization effects. A little study shows that this plan is not a workable one. Other workers are not paid on such basis and the engineer cannot expect to be.

We do not pay teachers salaries measured by the value to the community of education. We do not pay policemen according to the losses we would suffer with no organized force to check crime. The man who lets a contract to construct a building does not pay the contractor for the building according to the profits he will lose if the factory is not built.

One underlying cause of the present industrial warfare is that organized sections of workers, each of whom renders a necessary public service, are each trying to hold up all the rest of the community by stopping their services until their demands are granted. Thus we have over 200,000 longshoremen, expressmen, and other manual workers at the port of New York stopping the flow of food and fuel and a thousand necessities of life through that port to supply millions of people as a means of forcing compliance with their demands.

The engineering profession does not demand of the community that they shall pay to engineers compensation equal to all the benefit which engineering science and skill produces. Engineers

would not make such a demand and would be powerless to enforce it if they did.

Of course this does set an upper limit for the engineers compensation as for everyone else. If the pay of an engineer or a plumber or an artist or a cook is set too high, men will go without the service rather than pay the price.

It is seldom, however, that this measure of intrinsic value of the service *can* be applied to an engineer's compensation. The individual engineer contributes only one part to the building of a bridge, the operation of an electric railway, the ventilation of a mine, the location of a new highway. Who could possibly estimate the proportion his work bears to the intrinsic value of the final result?

We must find other standards, therefore, by which to gauge the engineer's compensation, and there are two standards offered. The first of these may be termed the living wage standard. According to this, there should be computed the investment of time and money in the engineer's education. His compensation then should be such as will support him and his family in the circumstances under which his position in the community calls upon him to live and in addition will repay his investment in his education during the average working years of his life. Now it is unfortunately the case that the average compensation of the average civil engineer falls below this standard; and in too many cases far below it. It ought not to be so. Theoretically the paying of less than a living wage for engineering service ought to result in driving men out of the profession and discouraging men from investing time and money in an engineering education. Practically the engineer whose pay is reduced below a living wage often finds it very difficult to change his occupation. Practically not one in ten of the students in the engineering schools have a clear idea of what financial return their education will give them.

The second of these standards and the one which, whether we like it or not, practically governs the compensation of engineers is the law of supply and demand. The client who is purchasing engineering service, if the engineer asks a price he thinks excessive, will try to secure some other engineer's service. In the employment of a draftsman or an instrument man or a hull designer or a metallurgical chemist, the man who fixes the salary will pay what he has to pay to get the service he seeks and no more.

We may assail the injustice of this standard. We may point out its tendency to reduce salaries below that set by the cost of living standard; but if it be attempted to ignore the law of supply and demand in fixing a standard of engineering compensation, the standard set up will be itself ignored.

The law of supply and demand, however, is by no means the sole influence in fixing engineer's compensation. The pay of a great number of engineers is fixed by statute law or ordinance or custom. Changes in such rates of pay are so slow that they have lagged far behind the changes in cost of living that have marked the last five

years. It is within the mark to say that thousands of engineers are today being paid not merely salaries lower than a living wage but lower even than would be fixed by the law of supply and demand.

For it is a wrong interpretation of the law of supply and demand to say that the wages are determined by the price at which a man will continue to work rather than quit his job. The question should be—is the pay such as will attract and hold competent men to undertake the work? That is the real way to measure the supply of engineers for a particular job. Be it particularly noted that if engineers turn down offers, the man who is trying to buy engineering service at less than it is worth will soon make up his mind that he had better raise his offer.

We must recognize also that the price of engineering service constantly tends to be depressed by the tendency of buyers to lower the quality of the service. Yet the value of engineering service depends almost wholly on its quality. Every engineer knows this; competent business men accustomed to employ engineers know it, but the public, unfortunately, does not know it.

But in applying the principle just stated, we must frankly recognize that there are two broad classes of engineering work. There is first the work of the professional engineer which calls for initiative, sound judgment, broad knowledge and ability to organize and lead men—perhaps for all these qualities. There is, second, the routine technical work involving little responsibility.

For work of the second class, the routine technical work of the field, the office, the shop or the laboratory, it would be a mistake to fix too high a wage rate. We must frankly recognize that there is a great deal of routine technical work which can be done well enough by the average intelligent boy of high school training. Much of it requires even less education. A few weeks or months of special training will enable a bright boy or man to become proficient in a good deal of technical work, for which a four years' course in engineering studies was formerly supposed to be requisite. Graduates in engineering, naturally will do more or less work of this class at the beginning of their career, but their compensation will inevitably be fixed by the competition of the boys who have had only the training of the trade school, the shop school or the correspondence school. For this class of engineering work the profession is powerless to increase materially the scale of wages—unless they are willing to copy trade union methods and decree that no man can handle a transit or a level, a T square or a slide rule, a testing machine or a blow pipe, unless he belongs to the union. The organization into trade unions of technical workers of this class has indeed already advanced far. Many engineers of good standing believe that such organization will secure for this class of men fairer treatment than they have had in the past. Even these trade union organizations, however, will be unable to go very far in advancing wages in the face of the competition of new graduates which the schools are all the time pouring out.

I agree that the skill and fidelity of the technical worker at the routine task has been paid for in the past at too low a rate. I know that the great fall in the buying power of the dollar has had the effect of reducing the pay of these workers as it has of nearly all salaried men during the past four years. Whatever can be done to better the condition of these men the profession should do. But we must finally recognize the limitations that stand in the way of doing for them all we would like to do.

Turning now to the other class of engineers—the men who are carrying responsibilities, the men on whose honor and honesty, on whose energy and ability depends the success or failure of the work—for those men the strongest kind of a case can be made out for adequate compensation.

In private business organizations in the field of mechanical engineering and manufacturing and mining such men have been recognized and properly paid. The great prizes in engineering, indeed, have gone to such men. In other fields of engineering, especially those fields where work is chiefly in the hands of public authorities, Federal, State or municipal, it has too long been the custom to pay for high class engineering service only a small fraction of what it is worth, and the quality of engineering service has decreased in proportion.

We shall be doing a great thing for the profession if we can raise the pay of engineers holding responsible places in public service to somewhere near the level of the engineers of similar rank who work for business corporations.

If we can have the men in high and responsible positions paid salaries of \$5,000 to \$25,000 a year, it will be easier to raise the pay in the subordinate grades to somewhere near what it ought to be.

#### SPEED?

The speed of submarine telegraphy is illustrated by the fact that five minutes are usually sufficient to cover a complete buying and selling operation between the London Stock Exchange and Wall Street. The distance between these two points is about 4000 miles and it takes the message less than a minute for the journey.

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