followers of Ruskin who assure us that railroads lead civilization backwards.

It is difficult to offer convincing proofs to the type of mind which worships the beautiful, and thinks its production a lost art. I think, however, that Leonardo da Vinci, or Sir Christopher Wren, the friend of Watt, would have said that beauty can be engineered as well as imagined, and I see in many modern works a beauty and a progress in the thoughtful adaptation of means to ends. Certainly such adaptation is a progress, and one most needed in our American civilization, where the wastefulness of our processes strikes all experienced observers. You know that it is your business as engineers to count the cost before you build your tower, to use just the right quantity and quality of material, and your education fits you for a most important mission to your fellow-countrymen. Go and teach the doctrine you have learned; persuade the farmer to save the useless sacrifice of beasts of burden upon the worst-graded roads in the world, to cut his forests so that some trees will be left for coming generations. You chemists may even have a word to say to our Congressmen, and tell them to prepare for war as soon as the fighting mood comes on by getting their powder ready. You can tell them that Chili saltpeter and cotton exist upon this Western Continent, and the skill to transform those materials into smokeless powder also exists here.

I suppose that the next war will not find us unsupplied with this particular article, and the next time we besiege a town it will be with heavier artillery, and perhaps a lighter general; but I fear that for a long time to come those who vote our budgets will still be improvident of the future, and indisposed to listen to the opinions of experts. Yet all prudent men are moving in the opposite direction. The railroad which formerly could not afford to employ engineering skill, now cannot afford not to. Every enterprise, large and small, is going to recognize the value of your trained knowledge, and to use your services more and more; but those conducting the greatest business of all, that of governing seventy millions of people, are slow in recognizing that professional methods and close calculations are everywhere pushing aside guesswork business.

I think that you have a peculiar claim to be heard. There are experts of all kinds who are pronouncing opinions on all subjects, from religion to gun cotton, and many of them discredit expert testimony; but you, scientific men, have learned methods and are working in fields where your work will speak for you; and nothing is easier to test and recognize than the value of the products which you turn out.

Your success will not only turn to your own profit, but also, as citizens of a great country, you may hope by your individual efforts, to gain over men to the belief that it pays to educate employees for every task which they have to perform; and if we are to enter upon a great colonial policy, the moment is pressing for the recognition of the truth by every citizen.

Yet, in bidding you farewell, I care very much to say to you that the things which I have described make up the smallest part between an educated and an uneducated man. Education is very much a matter of influence, or contagion, from man to man; and in this scientific school the relation between teacher and scholar grows closer, and oftentimes more friendly, toward the end; because in the small laboratory or class room sections you find yourselves trying to pass beyond the boundaries marked out by routine and text-books, and, in companionship of your teachers, trying to discover something new. This is the chief end of education; not so much to make you learned as to make you original, and to stand you on your own feet. The aim is the same in every branch of knowledge; but the discipline of science has thus far been most successful in attaining this result, by means of her wonderfully organized system for selecting the problems which we are prepared to solve, and for testing the absolute accuracy of the solution.

The genius of Aristotle, Bacon, Galileo, Newton, has built up for you a heritage which not only is unimpaired, but has had compound interest added through the ages. It has been our business to seek to put you in possession of this body of scientific methods for using the known to find out the unknown, and so far as may be to direct you in their application.

One thing more only will I say, and that is that you must have felt that the key to success in scientific work is a love for the truth.

As the love of money is the root of all evil, so the love of truth for its own sake lies at the root of all good, and the successful, well-organized search for what is absolutely true, is the most joy-giving and satisfactory occupation that a man can engage in.

You go out from here to all the ends of the earth having had less class companionship than in many a college, but you go to a closer companionship than exists among most college alumni, because you bring more directly every day into use what you have learned here, and well learnt since: unlike many college students you knew exactly what use it was going