neering may be costing 46 cents per working hour, English 18.2 cents. Either may be costing too much, or each too little. As for the results, the unfinished products, engineering instruction or English instruction, or the finished product, education, they still await measurement.

VI

Doubtless it would be well for the college to know exactly how it is spending, how it is losing, its money. What must be guarded against especially is the misuse of statements of costs, as well as inaccurate statements of costs derived from insufficient data and unscientific investigation. A determination of the cost per student hour, or per working hour, which does not separate salaries of the instructing staff into wages, general administration and departmental administration charges; which does not properly allocate to various departments costs of rent, power and other items; which makes no attempt "to apportion the overhead expense exactly, as would be done in a manufacturing business"—such a determination may, perhaps, be valuable and suggestive if applied to a hypothetical college, but is misleading and dangerous if applied to an actual institution for the purpose of deducing practical consequences and suggesting practical reforms.

There is no consensus of opinion as to what education is—except, perhaps, the widespread view that it is a failure—and no general agreement as to what it should be. It is, perhaps, unfortunate that so much attention is being given to the determination of the costs of this unknown quantity; unfortunate that, obsessed by the slight analogy between industrial and educational organizations, so many investigators and writers fail utterly to see the innumerable and insuperable differences between education and business. It is true that as yet but little harm has been done, but there are indications that if this tendency be not checked serious evil may follow.

The executive and administrative branches of the educational business are coming to be looked upon as its trunk and its roots. The college is coming to be looked upon as an establishment in which education is administered, not as a seat of learning, where knowledge is taught, scholarship fostered and wisdom diligently sought. The teacher is no longer looked upon as an essential part of education; he is no longer an individual, teaching in freedom and earnestness, but is simply one of a numerous class of underpaid workmen whose betterment is impossible and whose usefulness is doubtful. In investigating the costs of the educational institution it will be well to count these costs of education treated as a business, and to take heed lest academic liberty be sacrificed to executive demands; lest truth be sacrificed to expediency.

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FLOOD PREVENTION AND ITS RELATION TO THE NATION'S FOOD SUPPLY

The problem of preventing the enormous losses from floods is one of the greatest before the American people. It is second only to that of increasing the nation's food supply and thereby decreasing the cost of living. That the two problems are closely related will be seen from the following facts and figures taken from statements made by experts who have not been contradicted.

These few facts, which have been culled from a mass of overwhelming evidence should convince every reasonable person—

First: That the federal government's present policy of river regulation is wrong.

Second: That a better policy is possible and is now under consideration by Congress.

Third: The necessity for the immediate adoption of the new policy.

The present policy of building levees only is radically wrong because it ignores the necessity of preventing flood conditions, and is

confined to efforts to protect the banks of the river from overflow. In this the levees have failed. For although the government appropriates millions of dollars for such work, we nevertheless continue to have floods, causing the loss of many lives and the destruction of property valued at more than 100 millions of dollars a year averaged over a ten-year period. This levee system has also been tried on the Hoang Ho in China for thousands of years, and has failed there.

In this country the damage done by floods has been appalling. You remember well what happened at Dayton, Ohio, this year. You remember the photographs showing the terrible conditions in that city. The same conditions have caused heavy damage in *other years,* at other places. Pittsburgh, Cincinnati, Memphis, New Orleans, have all suffered. These cities are all in the Ohio and Mississippi River basin. Other rivers have overflowed and caused great damage without attracting so much attention.

The government by allowing flood waters to accumulate and rush towards the sea during the season of freshets and melting snow permits the food-producing power of the country to be reduced. This reduction results from three different processes.

First: The upland is robbed of moisture that is greatly needed by maturing crops.

Second: An enormous amount of valuable top-soil is lost by erosion.

Third: The lowlands are drowned. While the lowlands are much less in area than the uplands, their possible producing power is far greater per acre. In fact, they are the richest lands in the world. The loss from erosion is beyond computation.

Under the present policy of building levees only it is admitted that the banks of the Mississippi between Cairo and Donaldsonville *cave* in each year to the extent of 9½ acres a mile for a distance of nearly 1,000 miles. Each year, therefore, nearly 10,000 acres of the best land in the world is deliberately surrendered to the floods. Engineers when building the levees place them back as far from the edge of the river as they think will be necessary to last 15 or 20 years. Is that a business-like proposition? It is estimated that *1,250,000,000* tons of silt are deposited annually in the Mississippi River. Of this amount 600 million tons flow out through the mouth of the river and *650 million* tons remain to fill up the channel. This 650 million tons is 2½ times the amount excavated in digging the Panama Canal.

It should be borne in mind that this enormous damage by soil erosion applies not only to the farms that lie adjacent to our great rivers, but that a very larger percentage of the six million farms in the United States suffer great losses from soil erosion, and a consequent decrease in production. It should also be noted that under the present methods the navigation of the rivers in the upper reaches is almost impossible during the seasons of drouth. In fact, there are times when there is scarcely enough water for sanitary drainage. The *storage reservoir system* would assure navigation throughout the dry season.

The facts and figures above quoted show how important it is to conserve all precipitation. That this can be done has been conclusively demonstrated in different sections of the country. Col. Freeman Thorpe, of the Minnesota Horticulture Society, who owns a large experimental farm near the headwaters of the Mississippi River, has allowed no water to run off his farm for 17 years. His farm consists of cultivated land, pasture and forest. His methods are extremely simple and inexpensive, consisting chiefly of contouring and embankment work, the effect of which has been to *double the annual growth* of *trees* in his forest, more than *double the capacity of the grazing land,* and add largely to the productivity of the cultivated land.

Col. Thorpe declares that there are over *300 million acres of land* now *idle* on the great central plateau of the United States for the want of sufficient rainfall. This, he says, would be the best soil for scientific farming, if we compelled the *filtration into* the *soil of all* the *limited* precipitation. In other words, if the *actual* precipitation were conserved all this land would be available. Professor Waite, of the Department of Agriculture, owns a farm between Washington and Baltimore,

where he has worked along the same lines with results similar to those secured by Colonel Thorpe in Minnesota.

Government officials report that the cultivable land of the United States is capable of producing sufficient food to supply a billion people. If that is true why does the country actually suffer because of the scarcity and consequent high price of food. The main reason is a lack of water due to waste.

I shall now outline the *new* policy for which there is an insistent demand from all parts of the country. This new policy is based upon the old and wise adage that an *ounce* of prevention is worth more than a *pound* of cure. The policy to which I refer is proposed by U. S. Senator Francis H. Newlands and is now before Congress as the Newlands Bill. Briefly stated the main object of this bill is to *prevent* the swelling of the rivers and the waste of water during the period of freshets, by the construction of reservoirs along the source streams and also diversion canals for irrigating purposes and for raising the underground water level.

The details of the plan are to be in accordance with agreements between the federal and state governments and such corporations and individuals as may hold vested rights in the matter. The watershed of every river and stream will be protected. And it is proposed that the work shall be done by the engineers who have charge of the work at Panama.

That the nation's supply of water is of vital importance will be seen from the following figures. The amount of water required by the average soil for full productivity is 60 inches each year. How far short of this required amount the actual precipitation of rain and melted snow is, will be seen from the reports of the Weather Bureau.

Weather Bureau experts divide the United States into three districts. That portion lying east of the states of Kansas and Nebraska is called the eastern or humid section. In this section the annual precipitation is about 48 inches, or four fifths of the amount required. It is estimated that 30 per cent. of this 48-inch precipitation is allowed to go to waste. The soil, therefore, receives benefit from only a trifle more than half the amount needed.

The next section comprises the states of North and South Dakota, Nebraska, Kansas, Oklahoma and Texas and is called the median or sub-humid section. In this all-important section the total average precipitation is only 30 inches. This amount is supplemented, we are told, by natural sub-irrigation from the mountainous country farther west. This sub-irrigation does not average, however, more than 5 inches. It will therefore be seen at a glance that every drop of water falling in that section should be utilized if possible.

The third section is that part of the country lying west of the median states and is called the westward or semi-arid section. The rainfall here averages only about 12 inches, or one fifth of required amount. Comment concerning waste of water in this section is superfluous.

Let me now quote from another official report which clearly indicates the importance of water. This report issued by the government, after referring to the fact that growing plants require nearly 1,000 times their weight of water says:

> A pound of bread is the equivalent of two tons of water used by the growing grain; and a pound of beef the equivalent of 15 to 30 tons of water consumed by the animal, both directly and indirectly through feed. So that the adult person who eats 200 pounds each of bread and meat in the course of a year consumes something like one ton of water for drink, 400 tons for bread and 4,000 tons for meat, making 4,401 tons of water in all.

The question of conserving the water supply of the country is therefore second to none and the federal government could do an immense amount of good by publishing and conspicuously displaying in every post office, railroad station and schoolhouse in the United States, charts and photographs showing and explaining the method of contouring and embankment employed by Colonel Thorpe and Professor Waite, and warning farmers, planters and other landowners to conserve all precipitation.

The secretary of the National Reclamation

Association, Mr. Walter Parker, of New Orleans, declares that there are ten million acres of land in the upper Missouri River basin that could be sufficiently irrigated to yield a crop of hay worth more than one hundred million dollars each year. This land would require no seeding, only water. A kind Providence has furnished the soil and placed the seed in the soil and sends sufficient rain and snow to germinate the seed and support the growing plants. It only remains for man to utilize the precipitation, and receive the benefit.

You are urged to consider the above figures in connection with the present high cost of food. This high cost of food is undoubtedly due to the fact that millions of acres of land are producing nothing, while hundreds of thousands of farms in all sections of the country are producing only a fraction of the possible productivity, owing to the lack of water. It should also be noted that the construction of dams and reservoirs would also result in a large development of hydro-electric power. This increase of electric power should decrease the cost of production and should therefore be a contributing factor in decreasing the cost of living. The Newlands Bill recognizes the absolute necessity of conserving the food supply of the nation, which food supply is in such imminent danger from waste of water and from waste of soil by erosion. It would therefore seem that the bill is one that every person who is interested in the cost of living should urge their representatives in Congress to support.

We are told that the chief opposition to the Newlands Bill comes from the railroads. If this is true, the railroads have adopted a very unwise and short-sighted attitude. All fair-minded people realize and concede that the railroads are by far the most important industry of the country. Personally, I believe that the federal government should do all that it properly can to promote the safety, solvency and prosperity of the railroads. But the railroads would not suffer by the adoption of the Newlands plan, for the reason that they would gain through the increased productivity of the soil far more than they would lose through competition with water transportation.

Among those who recognize the importance of a new policy that will prevent this enormous waste of water and soil are President Wilson, ex-Presidents Taft and Roosevelt. The Congress of Governors which met at the White House in 1908 also strongly endorsed the new policy, which is splendidly stated by a Philadelphia newspaper, from which I quote as follows:

> We must prevent floods. We can make use of the natural reservoirs which nature has provided for the absorption of rains, and we can create artificial reservoirs for the storage of flood waters, as we are now doing on the Panama Canal. The natural reservoirs are the forests and the agricultural lands which absorb the rainfall and the melting snows. Our aim should be everywhere to increase the porosity and absorbent properties of the soil and thus prevent run-offs, which swell our streams into great floods, which now aggregate a damage upon property of the stupendous sum of nearly 200 millions a year in the United States.

We have land enough to produce food sufficient to supply a billion people. But we can supply nothing without water. Wastefulness is our national sin. Wastefulness of men, of time, of money, and of our great national resources, but I believe the figures I have quoted prove conclusively that we can not afford to continue to waste water. In conclusion, attention is called to an old saying to the effect that if each before his own door would sweep, the village would be clean. Let me paraphrase this by saying that if each and every farmer, planter and landowner would prevent the wasteful run off of water from his land, there would be no more floods or danger from floods, and the land would be so benefited that its value would be enhanced to an amount many times greater than the cost of operation, and the entire nation would benefit to a degree beyond computation.

JUDSON G. WALL,
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Note.—Since the above was written the United

States Department of Agriculture has decided to make a special study of the methods adopted by Colonel Thorpe.

A NOTABLE BOTANICAL CAREER

I HAVE before me the "Report of the Botanist" to the Regents of the University of the State of New York, bearing date of January 1, 1868, covering less than two pages, and signed by Charles H. Peck. There is internal evidence that his services began July 1, 1867, the writer reporting what he had accomplished in the half year since that date. A year later the "Report of the Botanist" covered about 80 pages and included a short general statement followed by (*A*) List of Species of Which Specimens Have Been Mounted; (*B*) Plants Collected; (*C*) List of Species of Which Seeds Have Been Collected; (*D*) Specimens Obtained by Contribution and Exchange; (*E*) Edible Fungi; (*F*) Species Growing Spontaneously in the State and Not Before Reported. This general sequence of topics has been characteristic of the long line of annual reports that followed these made forty-six years ago.

The latest report in this series was issued September 1, 1913, and was entitled the "Report of the State Botanist for 1912." Like its predecessors in recent years it contains an introductory general statement followed by (*A*) Plants Added to the Herbarium; (*B*) Contributors and Their Contributions; (*C*) Species not Before Reported; (*D*) Remarks and Observations; (*E*) New Species of Extralimital Fungi; (*F*) Edible Fungi; (*G*) Poisonous Fungi; (*H*) *Crataegus* in New York. Four plates (of fungi) and an index complete the pamphlet of one hundred and thirty-seven octavo pages.

As one looks back over this long series of reports, all from the hand of one man, Dr. Peck, he is powerfully impressed with the thought of what such a life of scientific activity has meant for the development of one branch of knowledge in North America. I was a young teacher just entering upon the work of enumerating the plants of Iowa when these reports began to appear, and remember with gratitude the help they gave me, and the still more helpful correspondence which beginning then has continued to the present. And this is not an individual experience, as may be seen by running over the lists of those who sent their difficult specimens to him for determination, and reported by him under the heading of "Contributors and their Contributions." The younger botanists of to-day have grown up with an abundance of books on the fungi, and with competent mycologists in so many of the colleges and universities that it has been as easy for them to learn the names of the fungi as of the flowering plants. They have not found it necessary to send their specimens to a far-away specialist for determination. So we should not expect them to have the same feeling with regard to a career like Dr. Peck's, as those of us have whose work began half a century ago. Yet for their sakes we may well pause here to enumerate some of the principal things in this man's life.

Charles Horton Peck was born March 30, 1833, at Sand Lake, N. Y. He graduated from Union College in 1859, with the degree of bachelor of arts, and later he was given the degrees of A.M. and D.Sc. by the same institution. For several years (1859 to 1867) he followed the teacher's profession, first in the Sand Lake Collegiate Institute, and later the Albany Classical Institute. Then he began his real life work as botanist for the New York State Museum, at Albany, and this has continued until the present time.

And now while we write the saddening word comes of such increasing physical infirmities due to advancing years as may well require him to rest from his long years of labor. There are to-day many botanists all over the country who will read this latest report with old-time interest, added to a personal regard for the veteran who has long occupied so prominent a place in the botanical field. It is given to few men to prepare such a report as this latest one at the age of four score years. It is the fortune of few to have erected so notable a monument as he has in the series everywhere known as "Peck's Reports."

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