

IS THE U. S. A PERMANENT COUNTRY, LIKE NORTH EUROPE

A Paper Read by Arthur J. Mason Before the Chicago Literary Club in
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"Happy the people whose annals are vacant," quotes Carlyle in opening his "French Revolution." Happy I say the country whose rainfall is properly delivered.

We all live under the thralldom of traditions—the basis of which we are generally unconscious of—or even wrong about. The particular tradition I propose to throw within an hour, too hold barred, is the tradition as to agriculture—a tradition we inherited, which was set up under conditions very dissimilar to those around us.

I think every man of Anglo-Saxon affiliations carries round through life the comfortable and beautiful spirit of Gray's Elegy—a thoughtful man at evening, the time for contemplation, as morning is the time for action—gazes over the countryside; twenty generations of men have come and gone; battle, pestilence and death play their part; still the stream of life like an actual river persists slowly, little by little refining itself.

Now, I doubt if Gray himself had any inkling that the neighborhood he viewed was almost unique for physical, that is, climatic conditions leading to permanence.

Mr. Alexander, one of the faculty at Nebraska university, in an essay on his native state, remarks: "The main part of the years of my boyhood were spent in a country village of southeastern Nebraska—just such a village as scores of others which today dot the map of the state. My earliest recollection of it is a place bare and windswept, open alike to the unrelenting suns of summer and the unrelenting gales of winter.

"It was with this change from a raw pioneer town to the snug trading hamlet of a well-seated farming community that I grew up; and the Nebraska I know best of all is, I suspect, the Nebraska of the transformation from virgin prairies into cultivated farms—a Nebraska of some hardships, but of a great adventure done once for all; for the prairies which I knew as a boy were just such as they had been, for century upon century, since the great ice had melted away to the north, leaving on them the strewn gravel in which I used to find onyx and agate; and the farms as they are now are surely much what they will be through as many centuries

more, perhaps, until a new age of ice comes again to drive away their summers."

This utterance fairly expresses the comfortable—shall I say, smug—state of mind universal. There is not the slightest chance of Nebraska's continuing fertile land until "another ice age." There is not, in my judgment, the slightest chance that it will continue fertile for a century hence—under present cultural practice.

The tradition of the permanence of agriculture is so grounded that facts make no impression on the public mind. Very little I find does make its mark on the public mind, unless it be dramatic, hence newspaper headlines. As all the great, the essential changes, physical, moral or intellectual, seeing they come by slow and small increments, are covert, we have the spectacle of society never knowing "where it is at" until it is confronted by a calamity, big or little.

Mr. Lowell, the astronomer from an Arizona desert, watches the planet Mars. He thinks he sees great public works, canals, built by intelligent beings to maintain life on a dying or half-dying planet. What an awful spectacle! One shudders and Campbell's solemn line, "All earthly things shall melt in gloom," oppresses the mind.

But we don't need to go to the planet Mars. The same thing is going on now, comparatively under our noses, in China. Our Professor Chamberlin, in that lofty and informing speech on soil wastage before the conference of governors in Washington in 1905, refers to the situation in China as "the pitiable struggle of certain oriental peoples to retain and cultivate the scant remnants of once ample soils."

To understand China one must clearly get this picture—400,000,000 people slowly compressed into the small area of remaining fertile lands. It is like building a skyscraper on a lot 20 feet square, unstable and hopeless. There is no surplus of food in China for domestic animals, either for work, for food, or for that essential thing, milk. The situation has obtained so long that it saturates the national character. People acquiesce in being without space and opportunity. I will later measure these conditions in a comparison with our own. A pathetic relic is seen in their veneration for antiquity—for them the days of plenty and opportunity. The China which gave to the world printing, gunpowder, paper, the mariner's compass, porcelain and other things, was a land of space, of opportunity, of movement—not the moribund China of today.

Even the China of today survives probably because of the whimsical natural freak which dripped the dust of central Asia—in inexhaustible loess soils, often 1,000 feet deep—over a part of north China.

The last straw in poor China's case is that in the province Germany took and Japan threatens, are some of the best deep loess soils of the Yellow River valley.

China is almost wholly an agricultural country. Under the congested conditions, an acre or two per man to cultivate, China's total harvest may be said when brought to a common denominator to be 15 bushels of grain per capita. While much less than half our people are engaged in similar agriculture, our corresponding figure is 100 bushels per capita.

The poor Chinaman eats his 15 bushels all himself, does all the work with his own muscles. He has no great surplus to support those faithful servants, domestic animals, or to form a stimulating, energizing meat diet. Most of all he has no surplus of manhood to mine, to manufacture, to transport, to amuse, to instruct, to form, in short, a great country like this. Everybody works, even father, merely to keep going.

Hopkins points out that the Chinaman by laborious effort, by economies in fertilizers we don't dream of, and even scorn, by scraping the mud bottom of his pond and carrying it to his little plots manages all told in the year to add in the essential element of phosphorus, perhaps the principal one needed, what we buy in Tennessee or Florida for four cents even now with prevailing high prices. On the one side a year's toil, on the other, I was going to say the price of a glass of beer—that won't do; beer is priceless—it will have to stand at four cents.

Allow me to conduct a simple experiment. I take a pail full of water; first resting the pail on the ground I gently pour it out—it slowly saturates the surface. I next raise a full pail, shoulder high, and rapidly establish a cataract. Any man with eyes must see that in the case of the last pail emptied, the soil is torn and washed. Here in a nutshell you have an image—the first pail resembles the rainfall in the permanent agricultural land of north Europe, the second pail the temporary countries.

I will now make two statements with complete confidence—first, that the surface of the earth with a rainfall corresponding to the first pail is very small indeed, and second, that the United States, decidedly, emphatically belongs to the area corresponding to pail number two, the cataract pail.

How cheerfully our young men went into a great war for posterity's sake; how languidly they hear of this more terrible enemy, insidious, undramatic, draining the nation's blood, the soil—the body of the soil itself, away to the sea or piling it on other lands unnecessarily and destructively.

It must be claimed that warnings enough have been given. When I came to write this paper I found how little I could add, yet I do not think any serious impression on the public mind has been made by the ample literature already available.

Quoting now from the speech of Professor Chamberlin, in Washington, made 15 years ago:

"Let us turn at once to the basal factor in the problem, the rainfall, the soil, and the soil-wastage, the special theme of this hour. The rainfall is an inherited asset, the soil is an inherited asset, even a little soil removal is an asset, but reckless soil-wastage is a serious error. Soils are the product of the atmosphere and its waters modifying the rock surface. When the atmospheric waters have aided the air in producing soil, by rock decay, they may pass, on the one hand, into plants or back to the surface soil, and thence to the atmosphere by evaporation, or, on the other hand, they may pass on down to the ground-waters and thence into the streams. The alternative is to rush away as foul erosive floods on the surface, wasting soil and plant food, gullyng the surface, choking the ravines, flooding the valleys, silting the pools, filling the reservoirs, sweeping out the dams, barring the streams and clogging the harbors. If it shall be found that all or nearly all the waters should go into the soil and thence into the underdrainage, coming out slowly and steadily by seepage and by springs into the streams, clear and pure, these streams should present nearly ideal conditions for water-food, for power, and for navigation. The solution of the soil problem may therefore be, in large part, the solution of the whole complex of problems of which navigation is the last term. It may thus prove to be the key problem."

In another place Mr. Chamberlin says: "Under such an estimate, to preserve a good working depth, surface wastage should not exceed such rate as one inch in a thousand years. If one chooses to indulge in a more liberal estimate of the soil-forming rate, it will still appear, under any intelligent estimate, that surface wastage is a serious menace to the retention of our soils under present modes of management. Historical evidence enforces this danger. In the Orient there are large tracts almost absolutely bare of soil, on which stand ruins implying former flourishing populations. Other long-tilled lands bear similar testimony. It must be noted that more than loss of fertility is here menaced. It is the loss of the soil-body itself, a loss almost beyond repair. When our soils are gone, we too must go, unless we shall find some way to feed on raw rock or its equivalent. The immense tonnage of soil-material carried out to sea annually by our rivers, even when allowance is made for laudable wash, and for material derived from the river channels, is an impressive warning of the danger of negligent practices. Nor is this all; the wash from

one acre is often made the waste-cover for another acre, or for several. Sometimes one's loss is another's gain, but all too frequently one's loss is another's disaster; and the 1,000,000,000 or more tons of richest soil-matter annually carried into the sea by our rivers is the nation's loss."

We are the heirs of all the ages. In no other case is that so true as of the people of the United States. A time came when mankind struggling up had realized rational ideas of government. I think it was Lowell who said, "God winnowed a nation for seed"; and the occupation of this part of North America began.

For millions of years Providence had been storing and accumulating soil, timber, minerals, against that event, leaving the property meanwhile in the trusteeship of Indians, whose culture and institutions were just suited for the job of leaving nature alone in her provision for us and keeping others from interference. Even the delayed Columbian discovery proved an advantage from our viewpoint, we were then soon to be ready.

Nowhere on the earth's surface had nature acted in such a large and generous fashion, in the storage of essential raw material, under favorable climatic conditions. We came into this great property, what a theater of action it has been for ardent buoyant men to bring into existence this glorious, effective, happy thing we call the United States of America.

All this time to a strange degree we have had the good will of Europe—not only the intellectual discoveries of Europe which no tariff could keep out, but I say again, the good will of Europe. I wonder if we properly value this long-sustained good will. One substantial effect of it I will mention. They sent their savings here to build up the country. Thirty-five years ago in Kansas I sometimes used to wonder whether the men on the ground did more than the unknown industrious mechanic, largely in the north of England, whose savings came in great volume to build the railroads, waterworks, irrigation ditches, houses, hotels and barns, to stock the land, to support the people until advancing tilth made the community self-supporting.

There is something primary about the storage of soil, distinguishing it from other raw materials. We can go to Cuba, or Chile, or Brazil, as we do, for iron ore or timber, or other elementaries. One can hardly conceive a great commonwealth without its due amount of useful soil area. One feels that we might get along without shoes but not without feet.

The instinct we all feel about good land is sound—perhaps it is a latent feeling, that only from good land can a robust stock of men come forth and one need not go far to verify this, no further at least than Kentucky, contrasting there the mountaineer with the bluegrass people.

For my part I never meet the mountain people without seeming to see evidence of former cultural qualities, not visible in the modern instance—perhaps it is because I have seen cattle deteriorate in poor country.

To go back to my two pails of spilt water. A whole school of agronomists point to Europe, an old country whose fertility is on the increase, and thus allay the feeling of alarm at decreasing fertility in this country.

I would first point out that these men always quote northern Europe, a land of small annual rainfall in inches, but frequent rains, a land having ideal conditions for the creation and retention of soil, a land of clear streams. Let those same men quote the south of France. The loss of soil in the south of France is the despair of its people; it has involved enormous expenditures to arrest, in any degree, and is the subject of a large literature. Now what is the difference between these two parts of France? They have about the same annual rainfall, allowing for bolder topography in the South. Merely this, as our returning young soldiers can testify—in the North it rains about 200 days in a year, in the South the fall more largely accompanies thunderstorms. Perhaps there are half as many days on which it rains, and the total rainfall in both cases is 20 to 30 inches.

The whole question of rainfall is a strange and interesting one, full of surprises. London and the Sacramento valley of California have a not very different annual rainfall. London the ever wet—Sacramento valley the almost ever dry. In one case frequent little rains all the year, coming on 200 days. In the other all the rain coming in three months, on 65 days, and for six months parched, baked, dustiness everywhere.

I wish I could get the job of allocating the rainfall as we in Washington were supposedly allocating everything during the war. One could so easily and advantageously take 15 to 20 inches off the Middle West and bestow it on the great arid region beyond the 100th meridian. Inasmuch as in all probability about the same amount of moisture passes over the United States each year and inasmuch as one cannot have a cake and eat it, then too much rain here means a drought there. In the summer of 1919 we had an unusual drought; contemporaneously all the East suffered from too much rain.

Strangest of all, at Culebra, Isthmus of Panama, our government found that it could not maintain a vegetable garden without irrigation; this in a place where it rains about 200 inches each year.

What is the situation in little green England where our traditions were established and slowly indurated in the mass of minds?

In 1837 Charles Darwin read a short paper "On the Formation of Mould." When he first announced that vegetable moulds are created by

the grinding and digestion of clays and soil material in the intestinal canals of the common angleworm, this announcement was greeted with some derision. Forty or more years later he followed this paper with a book of 300-odd pages on the same subject, in which he reiterated the early statements, now known to be true. I quote from page 308: "In many parts of England a weight of more than ten tons of dry earth annually passes through their bodies and is brought to the surface on each acre of land so that the whole superficial bed of vegetable mould passes through their bodies in the course of every few years."

The moist climate—absence of prolonged drought and frost—make England a paradise for these patriotic little creatures. You who are golfers must have observed the abundance of worms on putting greens, which are watered daily. I have myself counted twenty castings per square foot, nearly a million to the acre.

It is not far amiss to say that there are not more than one-half that number of worms per acre on our Corn Belt lands, that are present in agricultural England. Further, due to long inactive periods our worms do no more than half as much per annum as their Anglican brethren—a sad case of inefficiency, no doubt soon to be followed by demands for still shorter hours. If my figures are sound then the principal soil creative agency is four times as effective in England as it is in the Illinois prairie.

Now about soil-removing forces: in the main they are two-fold: surface erosion, and removal by wind in the form of dust. The former is many fold more important.

Every Englishman passes through life clutching the handle of an umbrella. This becomes second nature; so he feels naked and defenseless without one, even during a California summer.

Nevertheless, when the annual accounts are cast up it is found that the total rainfall of London and the eastern counties is but two-thirds that of Illinois—specifically, 26 inches per year in London and 38 or 39 inches in Illinois, an average of the state, of course. Precipitation is but 36 inches in Chicago. The English rainfall more resembles our practice of sprinkling lawns—the best of reasons why the lawns are green as their fields are green.

The streams of England are clear, stocked everywhere with the carnivorous game fish, preserving almost a uniform flow. Tennyson's "Brook" joins a brimming river—brimming, but not in flood—normally brimming and clear. Such streams in agricultural regions can only exist where the rain comes often, but not much at a time. For then the water enters the ground, finding its way into the streams through springs, that

is, underground. In this case no soil removal occurs. Soil removal, that is erosion, only occurs when superabundant rain flows over the surface.

One might here announce, agricultural regions with dirty streams are, must be, temporary. Agricultural regions with clear streams are, must be, permanent.

Darwin has plainly shown that the soil of Great Britain grows in depth with time—once—once—when the Indian roamed supreme, ours did also, but not now—I will come to that later.

There is no doubt about it, the fertility and the very body of the soil itself increases in Great Britain. That is more or less so, with a strip a few hundred miles wide across northern Europe—but where else is this so? I know of no place, except overflowed or bottom lands. The permanence of England is no whim. It is enshrined in the face of nature and worked into the character of the plants and the animals, of fish, as well as men. It is the hand of Jehovah himself. So thither we must look for what leads to permanence.

The legend of the stability of agriculture saturates poetry and all literature, like the legend of the Eternal Hills. It so dominates us that we are blind to the most obvious, or open our eyes too late. I picked up lately in Memphis a Southern agricultural journal, astonished indeed to find half of the space devoted to questions affecting the washing away of the land, urging contour plowing, such as we now so commonly see in the state of Georgia, and other devices or practices of the kind, shutting the stable door after the horse is stolen.

My special interest, and doubtless yours too, centers in this greatest of all continuous bodies of good land, the center of which we call the Corn Belt. Every discerning traveler recognizes it as the greatest feature of this country—a tract about 1,000 miles square with Illinois near the heart. Mr. Boyce somewhere says: "The United States consists of the Mississippi valley and a fringe on either side."

Without this great productive area there could be no New York city or Woolworth building; no Detroit with 3,500 Ford motors daily; no great orange groves in California; no United States Steel corporation; no Standard Oil company. The whole fabric of American success is squarely founded on this aggregation of homesteads.

It gave us our dominating position in the Great war; it forms the theater of action for the application of the spirit of the compact in the cabin of the Mayflower. The ideas of the Long parliament. The ideas coming out of the Revolution and the Civil war; its occupation and con-

quest have made the American nation what it is quite as much as the American nation has made the country what it is.

I, a foreigner, feel deep emotion as my mind's eye sweeps thousands of miles—from New York to the Pacific. Is this great heritage a permanent farm, or is it a mine undergoing exhaustion—not exhaustion of fertility, but the actual removal of what Professor Chamberlin terms the body of the soil itself?

I believe if you appeal to the fraternity of geologists and those whose duty it is to observe such things, the verdict will be fairly unanimous—it is but a mine undergoing rapid exhaustion.

I have lately acquired a farm; 160 acres of black corn land, not over 25 miles from this spot—smooth summit land without a ravine or waste place, every inch cultivable. For several years now I have affectionately watched this tract. There is no part 20 feet higher than any other. It has been under cultivation 50 years. Already the soil is gone from all the bumps—formerly the best part. My scrutiny led to the estimate, that almost half the soil has disappeared. When I came to compare this belief with the views of two excellent old Germans, quite observant men, who had been on the farm from boyhood, their independent judgment had formed the same conclusion. The loss of soil is obvious, plain to any eyes that care to scan.

A fair estimate for the whole countryside is that four or five inches of mould have gone. The soil and subsoil are very different in color—black the one, yellow the other. Let any man watch the plowed lands of this state; see the color change, in the depressions black, thence up the gentlest slope getting gray, then almost yellow on the prominent bumps; once it was all black.

A good deal has been said within ten years about soil erosion. Unhappily indignation has been switched into a wrong channel, as usual a scapegoat is found and our wrath is poured out on the man who cuts down trees—"Woodman spare that tree"—another dramatic, easily roused sentiment, for we all love and enjoy trees.

Now the fact is our prairie good lands were treeless. It is nearly always a sign of change from good to poor land to find woods appear—the black land is congenial to willows and cottonwoods; the oaks prefer slopes and breaks to creeks, where the gradient and accumulation of surface water-flow has naturally prevented the accumulation of mould. This is a fairly general rule.

Not forests, but well-grassed sod surfaces are the real creators and

preservers of our vegetable mould. Such were our prairies when Abraham Lincoln was a boy; such they had been for thousands of years.

The sheltered mellow land with its network of grass roots, mocked at erosion—it held the rainfall and led it underground; it furnished protection and an ideal home for our angleworm friend.

Darwin found few worms in woods; a fair proportion in cultivated fields—most of all in pastures—some fifty-odd thousand per acre. Here, perhaps, you will be cheered up a little if I announce that by the last census the angleworm population of Illinois numbers no less than 640,000,000,000 worms—6,000 for each man, woman and child in the United States. Is it Wall street or some plutocrat that makes them so scarce when the boy wants to go fishing? These figures unlike those from certain thriving towns heard from lately show a reduction from the last census. Further, these 640,000,000,000 citizens of Illinois, in intelligent and long sustained work toward the maintenance of the state, are more important than the 6,000,000 human beings in it, who only weigh one-tenth as much. Once I knew of a fine mine in Cuba, where it was said that the dump for debris was more valuable than the mine.

What a heroic picture comes to one's mind in the thought of the hardy settler, and his sturdy ox team, as they broke the prairie sod for the first time. One sees the tall, broad-shouldered, sunburnt man, the sod cabin, his wife and baby, the lonely prairie—it makes one glow with appreciation and gratitude.

We now know that when that first sod turned, a revolution took place, from stable to unstable. That beautiful black crumbly mould had then insufficient powers of resistance against a downpour of nearly 40 inches of fierce rainfall. In its unprotected condition it must pass off principally as coloring matter in dirty water—some to raise the level of bottom lands, some to pass off to the sea—in neither case doing any good to offset the first injury.

Each year more than 12 inches of water runs over the whole surface of this state on its way to some water course. This would not be so serious but for the fact that it takes place in a short space of time, bringing to the scene great mulching, tearing and transporting energy. This force is given its maximum injurious power by our form of agriculture. During June, July and August, the period of severe storms, we stir the surface of our corn lands as though to emphasize their helplessness.

Cotton culture is equally vicious. Our two principal crops, therefore, are just such as some far-seeing evil spirit might devise to assist the national nemesis, in sooth the devil of our forefathers.

Prof. N. S. Shaler of Harvard, 25 years ago, in an admirable paper on erosion, says:

"The primitive man disturbed the conditions of the soil no more than did the lower animals. He made avail of the natural products of forest, field and stream, never stirring the earth, except it might be to bury his dead; but in the first step upward, he began his manly career as a devastator. He became a soil tiller, and with the invention of this art began the greatest revolution in the economics of this earth that has ever been instituted by a living being. Each extension of civilization has widened the field of devastation, until nearly one-half of all the land is subject to its ravages. It is now a question whether human culture, which rests upon the use of the soil, can devise and enforce ways of dealing with the earth, which will preserve this source of life so that it can support the men of the ages to come. If this cannot be done, we must look forward to the time, remote it may be, yet clearly discernible, when our kind, having wasted its great inheritance, will fade from the earth, because of the ruin it has accomplished."

Again: "In the first place it should be noted that the plow, which has been much vaunted as a noble contrivance, is as ordinarily used an instrument which most effectively serves to compact the earth, so that when the few inches of ground tilled become soaked with water the fluid cannot penetrate into the deeper parts of the earth. The reason for this injurious action can be readily understood. The pressure of the foot of the plow due to the counter thrust of the force used in dragging it forward, through the earth, as well as the weight of the instrument, serves in a very effective way to compact and smear the surface over which it passes. When the frost penetrates deeply, the heaving action which it effects operates in a measure to overcome this effect of the plow, but in almost all fields, especially those in the southern parts of this country, the artificial hard pan is to the skilled eye most evident. It needs but a comparison of a bit of land which has been long under the plow with a like area still in virgin forest to show the true measure of this action. The one is for a few inches in depth moderately open, but at a lower level is so hard that water can penetrate it only in a slow way. The other is open-textured to so great a depth that the rain and roots can penetrate in most cases to the rock which has not yet been broken up."

This peculiarity is very plain on the lands I have lately been testing, of which I will speak later. One would think that such weather as we have lately enjoyed would wet most anything; such is not the case. In the plowed lands, the upper six or eight inches is in the condition of oat-meal mush. Below that comes Professor Shaler's artificial hard pan, by no means moist, requiring energy to penetrate with a spade. This is so

marked that one might tell blindfolded whether a hole was being dug on the railroad right of way or in the field nearby, by the sound made in digging.

Rich land is always finely comminuted. Our corn belt land is so fine a powder that it passes off largely, as stated, as coloring matter in the storm water, making the streams dirty. Perhaps here I have a semi-dramatic appeal—an appeal to those who love fishing—the fisherman's or rather the angler's vote.

To go back to the time when Mr. Lincoln was a boy, our heroic age, "When good King Arthur ruled the land." Then the streams abounded in bass and other game fish. These fish are largely departed—their places taken by carp and catfish. The popular legend regarding this substitution runs: "These detestable German carp have driven out the game fish"—to my mind about as logical as to say that the rabbits, still with us, have driven the wolves out. Disappearance of game fish permits abundance of the helpless vegetable-eating fish, who are the provender of the carnivorous game fish. "Kill the mountain lions and deer increase."

The fact is our dirty streams are congenial to the fish which survive. Game fish must have clear water to see a potential breakfast, to follow and capture it. They are not provided with feelers and great eyes like the fish of dirty streams who are adapted to feel their way to a loathsome breakfast of mud, containing minute vegetable and animal life.

I love to hear some doting grandad prate of the big bass he caught in '58 in Skillet Fork. Are any bass there now? His grandsons knowing the slimy stream today believe the old man is talking through his hat. In all likelihood some of you are now thinking I too am doing that very thing. Very well—come, we will leave the realm of discussion. Come with me into the definite realm of measurement.

It so happens in the state of Illinois we have over 300 miles of what agronomists would call a check strip—running from Chicago south. The Illinois Central railroad came early into possession of a right of way 200 feet wide—an unusually generous width. In open country there is nearly always a space between the margin of cut or fill and the enclosing fence. This strip has remained for 60 years, mostly untouched and carpeted with the old sod.

If all that has been previously alleged be true, if the erosion—wide-spread surface erosion over hill and dale—be really serious, surely it is only a matter of digging in the virgin soil of the right of way and contrasting such a hole with a competitive one on the cultivated field adjoining.

It was the purpose in this paper to report such a series of tests for 150 miles southward before this time, but the outrageous winter and still more outrageous spring has made it impossible. We have only examined the first 35 miles. As one goes southward from Chicago, the rainfall increases steadily all the way to the Gulf of Mexico, especially that portion of the rain which falls during severe storms, so that there is little hope of finding things better—rather the dismal certainty of their getting worse.

Behold the writer and his vigorous man Friday, like burglars along the railroad lands; first a hole in the ancient sod, and then another in the adjacent field, which may be said to have been under crop for 50 years; easier said than done, for between them is an excellent barbed wire fence with its eight or ten strands. It takes two men to climb such a fence, one to climb, the other undertaking with friendly aid to detach pants or coat sleeves or coat tails.

What have ye found in these tests? In the very first hole 17 inches of black soil—30 feet away in the field only 9 inches. Let me hasten to say this was a bad case and is not typical. It was a smooth flat piece of land, and we could see no reason for any especial wash. We never found in any test a loss of less than 3 inches. The average of all tests gave a loss of 4 inches of soil.

What strange thing the human mind is. One's attention is attracted to some matter, conclusions are formed, after years of conversation, observation and reading—a plan of final test suggests itself. It is impossible to avoid elation, even chuckling elation, to find one's general conclusions to be sound. Elation here at what? Only this, that the United States is not a permanent country like north Europe. It is a country like north Africa, where the splendid Roman ruins of cities attest the fact that the economic basis for such cities has been in some manner withdrawn.

I don't think we have any evidence of change of climate in north Africa. Remove the soil from any region and without diminution of rainfall it becomes arid. Without soil there is no local water storage. The rainfall runs off as it does from a slate roof.

Remove from human society all the agencies for water storage and most of us would speedily die of thirst, which is just what plant life with its limited reach does in these devastated washed areas. Some of this audience somewhat dimly, perhaps, hark back to the days of the great American desert, including what is now productive Kansas. The same thing happened in Australia. I know of fertile, happy regions in that country in what was first pronounced desert. This always happens in new extensive areas. The explorer without water storage facilities or knowledge of how and where to find water, suffers as though in a veritable desert, and

such he dubs it. Water storage facilities tide over human society between rains. Soil performs the same service for plant life.

My case stands or falls on the test which anyone can quickly carry out by digging on the old public roads, or railroad rights of way. If it be true that the cultivated lands show the substantial loss, as I have indicated, then to death and taxes we must add a third—the disappearance of the soil by erosion, an inevitable, silent, malicious enemy—a thousand times worse than the German army. Sad to say for human society, the United States is the rule, while north Europe is the exception.

Hoping as an active form of propaganda to start this audience on a career of digging, a few directions, in passing, perhaps, like those found on a box of patent medicine, may not be amiss; avoid hedges, as they are collectors of soil and unfair. The homely post and wire fence has no such habits, and is fair—shall I say inoffensive? Bottom lands are out of court. It will be admitted that they are permanent. “Lake Chicago” of the geologist, that is, the old lake bed in the immediate vicinity of the city, is also immune, for it robbed the prairies long ago and soil lies deep all over it. The remaining 95 per cent of the state is a fair chase; go to it.

Another caution or advice. Note whether roads or railroad rights of way are markedly higher than the adjoining cultivated field.

At this season of the year, perhaps a third of the countryside lies upturned and bare from fall and spring plowing. The most obvious thing is the change in color, before mentioned. The subsoil or clay on our prairies is as markedly different in color from the upper black loam as the yolk of a fried egg, sunny side up, is from the white. In rolling country the summits of the little rises are now often yellowish gray, approximately the color of the subsoil.

One of the first suggestions coming to the mind of the interested, is the question, was it always so? Our undisturbed railroad right of way furnishes the answer.

There are perhaps twenty such bumps in the territory we tested. In the field a yellow harsh soil, leaving the plow in clods, resisting the harrow's teeth, remaining lumpy when the black soil under similar treatment is crumbly and smooth, finally yielding a crop not worth the trouble. Beautiful black soil lies but twenty feet away on the railroad land; in no case did we find less than eight inches.

Sheet erosion, that is, the gradual removal of part of the entire surface area, must be clearly differentiated from obvious erosion showing itself in little gullies, getting larger and larger and finally forming chasms too bold to cross with plowing operations—technically known as gullying.

The last form has the obvious, dramatic quality, which impresses the public mind; it, therefore, fills the public mind with the notion that the erosion much talked about is of that form. It is not conscious of any other. Nevertheless, Bulletin 207, Illinois agricultural experiment station, states that “sheet washing may not ruin the land so quickly and so completely as gullying, yet much more damage is done by it.”

Please understand that the erosion I am now dealing with is sheet erosion, not gully erosion. The latter is serious only on lands occupied by tenant farmers or careless men. It can be dealt with mechanically as most of you know. This is one of the greatest objections to tenant farming. Under our severe climate the occupant must have an abiding interest—an interest in one or two crops is not sufficient to make him a good trustee.

Erosion naturally shows first on the gentle rises of our prairies—like the bald spot on a man's head it begins at the top. Each year it gets a little larger, proceeding down the gentle slope, expanding like a loathsome infection; a comparison unfair to the loathsome infection—for it commonly leaves behind an immune zone to be rejuvenated. Our erosion leaves in its rear permanent ruin.

Eighty odd years ago Darwin noted that as a consequence of the work of earthworms the upper five or six inches of soil was free of grit and small stones. The earthworm has a gizzard, which he, she, or it, keeps supplied with millstones, spewing only at the surface the very finely ground product of digestion—a work which goes on at night when you are asleep.

We found the same thing on the Illinois prairie. Small stones only appear in any number five or six inches below the surface in the natural sod. Very soon, therefore, we could judge the wash and loss before digging the hole, by the presence of many or few small stones on the surface.

Now why should anybody be astonished? For 30 years now we have been hearing of the worn-out lands of the East. Like the ringworm or erysipelas the failing land story creeps West. Iowa the new has supplanted Illinois the older, in the last few years. How many more such jumps can there be? None as you know. The public mind has somehow supposed this wearing out to be loss of fertility merely, that is remediable. Instead we have here a loss of the body of the land which, carried too far, is hopelessly irremediable. We have, heretofore, had new lands to move onto, the best lands of all.

The growth of large cities requiring dairy products has given a fresh, a novel use as pasturage for the more or less worn-out lands of the East—

food for animals being much imported from the West. This circumstance has covered up the truth; as have also better culture, better seeds, better knowledge.

Our great agricultural department is a great booster department, and seems to deem it a duty to flatter the farmer and the country as a steady diet. This policy has fooled many people.

The late Cyril G. Hopkins comments as follows: "The fundamental doctrine of the United States bureau of soils is indeed a pleasant one and highly important if true, but exceedingly dangerous and condemnable if not true." It reads as follows in exact quotation:

"That practically all soils contain sufficient plant food for good crop yields. That this supply will be indefinitely maintained."

Again: "The soil is the one indestructible, immutable asset that the nation possesses. It is the one resource that cannot be exhausted, that cannot be used up."

As a matter of fact at this time the department was riding a newly acquired hobby and was temporarily blind, as Hopkins goes on to show, to the whole experience and conclusions of mankind, including its own reports.

Strange, is it not, that a statement quite true should so mislead? It leaves out the element of time. Suppose that by a process of excavation we removed all the soil from the surface of the state. There would remain in the subsoil all the necessary ingredients to make another covering of mould. That could not, however, be done in a day. The best judgment I have access to, believes it would take 2,000 or 3,000 years.

The Agricultural department has issued a substantial literature on soil erosion. For 30 years, able and learned streams of evidence and wise advice have flowed therefrom. Probably undue emphasis has been given to gully erosion, due in all probability to the fact that the granular soils of the older Southern states showed injury to an alarming extent in that fashion very early. Unhappily the bulletins on soil erosion only reach a special audience. The flattering statements reach all, through the daily press.

As a stand-off to the two genial statments just read, appealing from one Phillip to another Phillip, I quote the same department in Farmers' Bulletin 20, 1894: "Thousands of acres of land in this country are abandoned every year because the surface has been washed and gullied beyond the possibility of profitable cultivation."

Referring now to Bulletin 71, bureau of soils, 1911, page 29, states: "It was shown by the national conservation commission, on the basis of estimates received from 30,000 farmers, representing every county in mainland United States, that 16,597 square miles of farm land have been abandoned." Perhaps you will grasp and digest these figures better, when I state that 16,500 square miles is about equal to the entire cultivated area of England.

Sheet trosion is most active in the finely divided clayey soil of the Corn Belt just because it is so rich and light, but perhaps most of all for the reason that in this latitude there is no time after the last cultivation of corn for a protective crop of weeds to grow.

South of the center line of Kentucky a labyrinth of weeds springs up between the rows during fall and winter. Northward, especially in Illinois, the unplowed land lies as bare as one of our asphalt street surfaces. As for the plowed land, God help it. You see it slipping down hill, glacierlike. The beautiful fine mould appears more a jelly than solid land. The richer it is, the deeper it is, the worse the sheet erosion in spring.

Now, having added to Francis W. Parker's list of American ruins, I suppose I am to calmly set forth, in the customary reformer's fashion, how this pending calamity may be averted.

First, it may be noted no country has in the past proved permanent under our climatic conditions. The sign and badge of this is the terrace. In all old countries, when too late, folks try to keep some of the soil from running down hill and away to the sea by the device we call a terrace. Whether in China, Corea, Central America, it always fails. In some cases the very race who built the terraces disappears. We must do better than others of the past. One thing is fairly sure, we must abandon the cultivation of corn, that is, maize, and cotton as now carried on.

It must sound like a death sentence to our people to be condemned to go without corn. The fact is corn has not produced a single domestic animal. It duplicates, but the choice parent stock always comes from countries where corn is unknown. Hereford, Shorthorns, Jerseys, Holstein, sheep, horses, both light and heavy; poultry, excluding the turkey, all come from cornless places. We still keep up our quality by importing choice studs, the parents of the future, from these places—England, north France, Holland, Belgium and contiguous countries, which support twice as much stock per acre as we do; they have no corn.

We must shift to a form of culture which keeps the soil bound together and protected by some form of sod. Of all such plants alfalfa

stands head and shoulders above the rest. If our corn lands were converted into alfalfa fields we could support twice the weight of domestic animals we now do, and this is the purpose the Corn Belt lands now serve, the support of domestic animals.

It is a curious thing that wheat, which mankind of our breed mostly rely on, is the crop grown on the fringe or frontieh of agriculture—western Kansas, Dakotas, northwest Canada, Australia, Argentine, the semi-arid places. Wheat is a pioneer culture. As soon as a region advances in comfort and wealth it drops wheat growing and devotes itself to the more ignoble job of raising meat or dairy products.

This paper has quite failed of its purpose unless in your minds it has established the fact that no time can be wasted. We must look this thing in the face squarely, with a view to action, coping with our greatest enemy, which, strange to say, is also our greatest friend—the rainfall.

There must in this country be a return of interest in the commonplace, and away from the dramatic. On of my Yankee neighbors and professors lately remarked: "One of the greatest assets of Great Britain is the fact that its people can be interested in the commonplace." You will remember how Taine, the Frenchman, accounted for the survival of the British aristocracy, when he found a duke to be the best judge of turnips.

If the argument here advanced be sound, how much more important the matter is than the result of the next national election or the world's series of baseball occurring about the same time.

What does it matter whether China is a republic or otherwise when the poor people are without space of good land to found what we call a happy or vigorous nation? How can they, without domestic animals or meat, compete with us who have both in abundance? What shall we be when we don't have them both in abundance? We know surely from the present situation of much of Europe. How much of our comfort is due to the bounty of nature? How much to our superior intelligence and energy?

The United States is not a permanent country like north Europe; cannot be, unless we turn to the task of making it one by conduct altogether different from present practice. Within a century as we now go, Illinois, from being the envy of the world for its rich lands, will change to a harsh, unproductive waste. If we have lost four inches of the best soil in fifty crops, the remainder will disappear in about the same time, for it is a case of unstable equilibrium. The more soil we lose the faster the remainder goes.