every reason ceases to be a mere generality, and is converted into dollars. Then he studies the operating expenses for many years past to establish, as far as may be, the ratio of maintenance and depreciation to investment in depreciable property. But, being more than an accountant, he goes beyond the accounts into the engineering records to ascertain what property has been abandoned without being charged to maintenance or depreciation accounts. He may thus discover inflation in "book values," but he accomplishes something that more than offsets such inflation by proving that the true operating expense has been greater than the accounting records indicate, and that, therefore, if the past is any criterion of the future as to obsolescence and inadequacy of plant, the company is entitled to earn depreciation annuities in excess of those normally provided.

Instead of making any such comprehensive historical accounting analysis, the railways have uniformly fought against it, and, in the writer's opinion, have lost many a case that otherwise would have been won. By contending that depreciation reserves are wholly unnecessary in railway operation, and that renewals should be met as a current maintenance expense, the railways have sought to save their surplus and by doing so, lost their entire rate cases. Seeking to bolster up their net earnings by this illogical procedure, they have brought themselves to the very precipice of ruin in many an instance, and have at times precipitated themselves over the precipice.

Of all the contentions by which railways have killed their cause, the absurd argument that a railway needs no depreciation reserves is perhaps the most astonishing. The degree of the absurd claim that a large diversified plant needs no depreciation fund is best appreciated by studying the practice of the most successful great utility company in the world—the American Telephone & Telegraph Co., commonly known as the Bell System. Instead of a policy of hand to mouth living, this great company has long insisted upon providing adequate depreciation reserves for every item of its plant. Now witness the result: While the railways of America are unable to sell their stocks to provide for betterments that would yield a good profit, the Bell System finds no trouble in continuing its amazing growth.

Of course, like the poor card player, railway companies attribute their own unfortunate condition entirely to the "bad deal" they have received, and point to the relative freedom of the telephone companies from Commission interference. And, also, like the poor card player, the railway companies will insist that one must have held their very hand of cards to appreciate its weakness. It is always the fashion to ascribe financial and other losses to ill fortune. In this respect, at least, the railways have garbed themselves in the latest, though also the oldest, mode.

Put plainly—and this is the time for plain speaking—the railway companies have botched nearly every great rate case thus far presented to the Interstate Commerce Commission. The fundamental cause is a smug, self-complacency that has led to ignorance of the methods of the utility companies that are succeeding under precisely the same conditions that yield the railways nothing but failure. Wrapped up in worship of their own precedents, imbued with the idea that to know anything about railway problems one must have always been a railway employee, railway officials have attained to the climax of financial absurdity in their belief that depreciation funds may be wise for others, but are useless to railways. The origin of this absurdity is not far to seek. It has sprung from the early practice of bonding railway property under mortgages that called for net earnings about double the bond interest. To make it appear that net earnings were double the bond interest, it was usually necessary not to deduct anything for a depreciation annuity. The deception once begun had to be continued, and it very soon was argued that there was no deception involved, for renewals could be met when they materialized. Yet when they did materialize on a large scale—as when extensive relocation of lines became necessary to handle traffic more economically—renewals were not entirely charged to maintenance. For the most part they were then charged to capital. This practice resulted in strong opposition to government appraisal of railway property, for fear that overcapitalization would be disclosed—an opposition that is not yet ended, in spite of accumulating evidence that the increments in right of way and land values have more than offset other reductions in book values that an appraisal might make necessary. So one wrong bred another and led to the greatest mistake of all—the damning of Commission regulation and Commission appraisal of railway property.

The writer feels that unless Commission regulation of railway rates is to fail completely, there must soon come a complete change, not only in the manner of presenting the railway side of these cases, but in the theory that underlies railway accounting and financing. The Interstate Commerce Commission itself has urged the necessity of providing depreciation reserves. Instead of seizing the suggestion as a life-saver, the railways have cast it away.

Summed up in one sentence, the writer's theory of the proper presentation of the most important single element in a railway rate case, is this:

Welcome the I. C. C. proposal to establish adequate depreciation reserve funds, and then demand that rates be raised sufficiently to provide the reserves and still leave adequate net earnings upon the appraised value of the property.

Every effort should be made to finish the railway appraisals speedily, even though the appraisals be admittedly incomplete. It will be said that the present refinements of appraisal work will admit neither of speed nor low cost. Shall appraisal definements be permitted to go to such extremes that railways are unable to meet the demands of the country, while engineers and accountants split the last hair? The writer himself has used the highest degree of appraisal refinement in certain cases and he has also used the most rough and ready methods. He knows that these two extremes of method yield far less difference than is to be had as a result of differences in appraisal theories. He has talked with many appraisers and finds them of the same mind. Hence, for all practical purposes, every railway in America, if it wishes, can prepare an appraisal within 18 months, that will serve the immediate purposes of a rate case.

Later refinements of appraisal work can then be carried out at leisure.

The immediate effect of establishing adequate depreciation funds will be to give greater confidence to investors in railway securities, for it will be realized that the era of hand to mouth maintenance of railway property has come to an end. To add to this feeling of security, the depreciation funds of each railway should be invested in the bonds of other railways, thus diversifying the locality investment and keeping the funds in a condition that permits of easy liquidation through the sale of the bonds.

WHY ELECTRIFICATION OF RAILWAYS WILL MAKE WORK FOR RAILROAD CONTRACTORS.

The economic success of the electrification of several hundred miles of the Chicago, Milwaukee & Puget Sound Ry. through the Rockies, has probably been the deciding influence that has led the Great Northern Ry. to announce plans for electrifying all its lines in the state of Washington at a cost of about $20,000,000. Of course an other influence leading to such a decision has been the revival of railway business, resulting in substantial increases in net earnings.

Some railroad contractors may not realize that in electrifying these western railways a very large part of the money will be expended in building reservoirs, dams, ditches and pipe lines; for it is planned to develop water-power sufficient to generate all the electric current used

to run the trains. The cost of the power plant equipment—waterwheels, generators, transformers, etc.—is a comparatively small part of the total cost. Hence, of an expenditure such as $20,000,000, a very large part will go to contractors who build the reservoirs, "flow lines," foundations and pole lines.

It seems wise to make this explanation, for we find that a good many railroad contractors are apt to regard the work of electrifying a railroad as being out of their field entirely, whereas the electrification involves much construction that they are competent to handle.

With millions of horsepower of water still undeveloped, and with the price of fuel steadily rising year after year, it has long been evident to farsighted engineers that practically all railways will eventually be operated by electricity. The word "eventually" seems now likely to become definite and to give place to say, "within the next 15 years."

The editor knows of several contracts between western railways and large hydro-electric power companies involving the purchase of large quantities of power at about half a cent per kilowatt hour, which is at the rate of about 5 ct. per horsepower per day of 8 hours. It is obvious that a considerable amount, say 30 per cent, of the power can be lost in transmission along the wires to the electric locomotive and still leave a very low cost for the power at such a rate as ½ ct. per k.w.h.

The advantages of electric traction do not end with the low cost of power. In fact it is claimed that the savings in locomotive maintenance are almost as great as the saving in power cost. The maintenance cost of locomotives, exclusive of round-house attendance, amounts to three-fourths the cost of the fuel that drives them. Annual repairs to locomotives average 18 per cent of their first cost, exclusive of renewals of locomotives that are scrapped, which is another 4 per cent of the first cost. Although electric locomotives have not yet been long enough in service to give a complete answer to the question of repairs on them, the known facts point to a maintenance cost about one-third that on steam locomotives. It should be remembered that a boiler on wheels, running at high speed over rails, is subject to tremendous wear and tear. Due to the necessary type of rather crude engine and boiler construction, a steam locomotive is an extravagant consumer of coal. Furthermore, a very considerable part of the rolling stock of a railway is now kept busy hauling fuel for its own locomotives.

When all the costs—not only operating expenses but interest and depreciation charges—incurred through the use of steam locomotives are summed up, it will be found that the steam locomotive is already "out of date" on most large railways.

IS A GREAT REVIVAL OF RAILWAY BUILDING IN SIGHT?

Were it not for two things, one political and the other semi-political, we should be witnessing right now a great migration of capital into the railway field; for the growth of the country districts has not kept pace with the growth of the cities, and there is a very evident lack of transportation facilities. But capital, while keenly sensible of the need of more and better railways, is fearful of not being able to get its reward. State railroad commissions, particularly in the west and south, have hammered at railway rates for 10 years and still hammer. The Interstate Commerce Commission has limited powers and is so overloaded with work that the railway investor sees little assurance of getting both prompt and adequate regulation of rates from that source. Finally there has come the menace of labor troubles on a gigantic scale, with a dose of political soothing syrup that would gag a mule.

In spite of all clouds, there is a sun still shining behind them, and the sun is the economic necessity for more and better transportation facilities. The nation's railway clothes fit it "too soon"—and the pants are up to the knees and its childhood vaccination marks clearly visible through the skintight coat sleeve. Everything that is of the railroad is oppressingly restrictive, and something has got to bust. What seam will rip first, we don't know, but we are certain that a rent must start somewhere and soon.

At present the railways are trying to influence Congress to do away entirely with the state regulation of railway rates and to give the Interstate Commerce Commission sole jurisdiction. But the old state's rights theory blocks a considerable part of the roadway to such a change. Already some state railway commissioners are earnestly advising against being shorn of their own Samsonian locks. Nevertheless the movement toward a radical change in government regulation methods, if not in policies, is well under way, and there is strong probability that the present Congress will do something radical. Whatever is done will undoubtedly serve to restore confidence in railway securities as a safe investment. It needs restoration of confidence, and nothing else, to start a new and great railway construction period. As indicated in another editorial in this issue, electrification of existing steam railways is probably the most pressing change, if we except enlargements and changes in terminals and means of loading and unloading freight quickly.

The next step will be the building of new branch lines as feeders to existing trunk lines. This will open up some new territory, but that is of far less economic consequence than better development of territory now tributary to railways. Branch lines are too far apart in the majority of agricultural states. In some of the states, notably Texas, there are so few railways that most of the land remains almost worthless.

Railroads always have been, and in spite of the automobile, always will be, the greatest agents in effecting development of agricultural lands. For some peculiar reason, the public has let political cataracts grow over its eyes till it can scarcely see the real worth of railways as general developers of agriculture. The suffering resulting from high food prices, due to this partial blindness, seems now acute enough to lead to an operation that will bring permanent relief. Here's to the hope that Congress will wield the knife courageously and speedily.

MANUFACTURERS OPPOSED TO AN EXCAVATING MACHINERY SHOW.

In our November Excavation and Railway Monthly issue, we suggested that it might be advisable to hold an annual exposition or show of machinery and equipment used in excavating earth and rock. We have received letters from 10 manufacturers commenting on our suggestion, and only one of them is favorable to the plan. Even that one fears that it would be very difficult to display heavy machinery in operation, and feels that if the machine were not at work the show would lose most of its educational value.

The majority of these manufacturers seem to regard three objections as being so great as to outweigh all advantages. First, the size and weight of many excavating machines are such as to cause considerable expense in transporting and assembling them. Second, the machines should be exhibited in operation, which requires considerable area, varying conditions and suitable weather. Third, a great enough number of prospective buyers would not be likely to attend the show.

Two of these manufacturers have had experience at shows in allied fields, and do not seem satisfied with the tangible results. This, however, is not a sufficiently strong objection in itself, for it is not the immediate sales that alone warrant holding any exhibition of machinery. Exhibitions of this kind are primarily educational in their effect, and therefore like other kinds of publicity that are aimed to give possible users of a product a better idea of its economic efficiency and field of application.

Whether enough interest could be aroused among contractors and engineers engaged in excavation to induce a large number to attend a show is, of course, problematical. We believe that this difficulty could be overcome by proper publicity methods, particularly if an ex-