A great deal of attention has been paid in the design of this motor, while great care has been taken in regard to durability and strength, to reducing the weight to a minimum. For this purpose, and with this object in view, cast iron has been dispensed

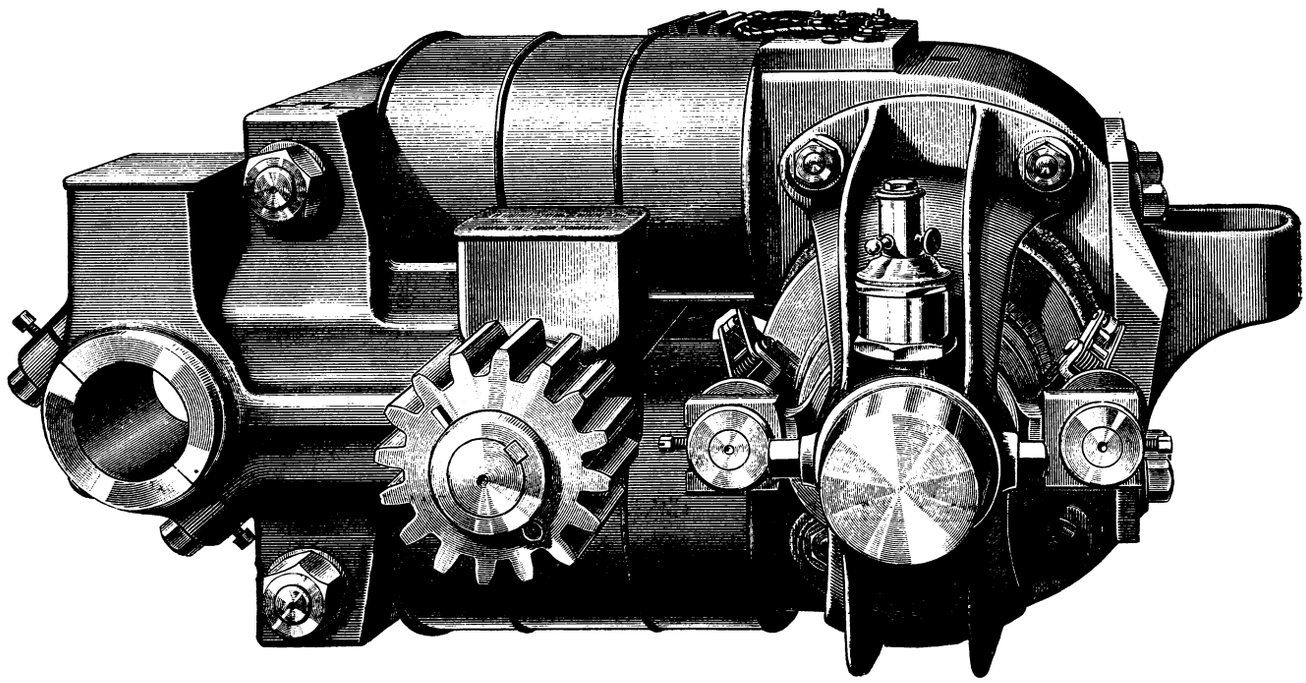

FIG. 2.—NEW SPRAGUE ELECTRIC-RAILWAY MOTOR.

with in the cores and yoke of the field-magnets, and wrought iron substituted.

These motors are already in operation at Wichita (Kan.), Marlborough (Mass.), Cleveland (O.), Cincinnati (O.), Erie (Penn.), Atlantic City (N.J.), and at one or two other places where they have been installed. They have been shown to give very good results, and in the future this type of motor will be used in all of the Sprague electric-railway installations.

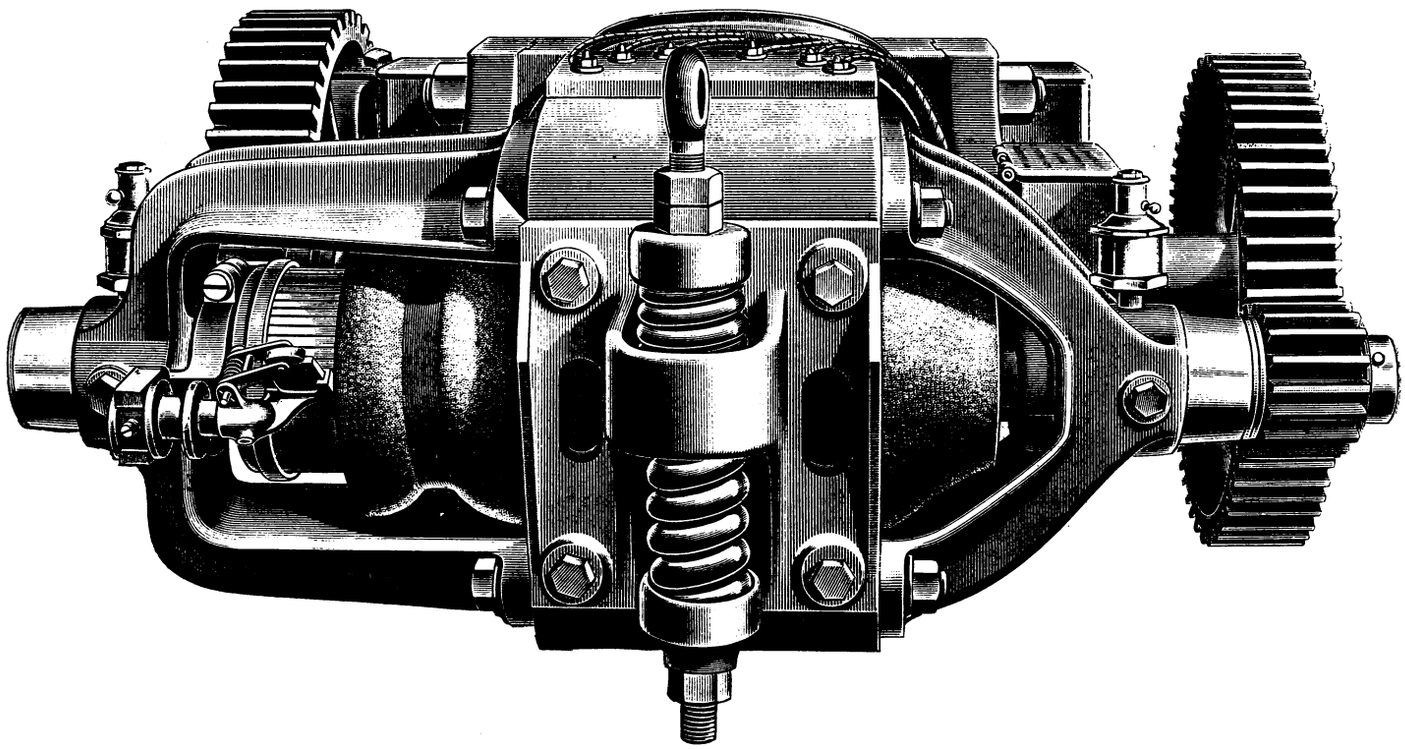

FIG. 3.—NEW SPRAGUE ELECTRIC-RAILWAY MOTOR.

GIRDLING TREES TO IMPROVE FRUITFULNESS.

IN many sections where the soil is moist and rich, fruit-trees grow largely to wood and foliage, and fail to produce fruit until they reach considerable age and size. To discover some means of hastening the fruiting of such trees, the following experiments were made at the Hatch Experiment Station of the Massachusetts Agricultural College. A row of crabapple-trees of about the same size and condition of growth were selected, and treated as follows: 1st, Three trees were girdled by cutting out a ring of bark $\frac{1}{8}$, $\frac{1}{4}$, and $\frac{1}{2}$ inch wide at the ground, July 12, 21, and 29; 2d, Three trees were girdled just below the main branches with the three widths of girdle as in 1st, July 12, 21, and 29; 3d, The same as above was

made on one or more main branches with the three widths of girdle, July 12, 21, and 29.

The results were as follows: 1st, All the girdles made near the ground healed over readily and completely; 2d, Those on the main trunk healed less completely, but sufficiently to insure a good growth of tree and the covering of the injured part in another year; 3d, The girdles made in the branches healed less completely than the last, and in two instances the new growth failed to meet, and consequently the branch died soon after starting growth in the spring; 4th, All showed a marked increase in fruitfulness over those not girdled; 5th, Little difference was observed in the effect of the girdling made at different times or in the various widths of the ring of bark taken out.

No definite conclusion can be made at this time as to the effect of this treatment upon the permanent health of the tree. Observations for many years alone can determine the point.

Reasoning from analogy and from the known laws of plant-growth, this treatment can be advised only upon trees that are planted too closely, and a part of which must be removed after a time, to allow the full development of others, or those in very rich, moist soil which are long coming into bearing.

Cutting rings of bark from the canes of the grape-vine to hasten the time of ripening has been practised more or less for many years to prepare large specimens for exhibition, but only for the few years past has it been practised to hasten the crop for market.

In a series of experiments made in the college vineyard in 1877 and 1878, and recorded in the "Report of the Board of Agriculture of Massachusetts" for 1878 and 1879, it was found that removing a ring of bark early in July, a quarter of an inch wide, resulted in hastening the time of ripening from one to two weeks.

It was also concluded, from very careful tests made at the time, that the increased size and early maturity were not at the expense of the quality, and that as far as could be determined at that time, and which further observations have confirmed, the vines are not materially injured by the girdling.

Girdling has been practised in the college vineyard more or less every year since, with favorable results. The canes that are to be cut away at the fall pruning only have been girdled, to avoid any possibility of injury to vine or root from stopping the downward flow of sap by the girdle.

Some seasons the results of this practice have been more marked than in others, but generally the increased price obtained for the early fruit has much more than paid expenses of the work; and in seasons of early frost, to which many sections of New England are liable, it has made the difference between total failure and fair profit.

To save expense in the work, for the past two years the girdling has been done by twisting a wire very firmly about the canes the last of June, above the point where the cane is to be cut away at the fall pruning.

About No. 20 wire has been found best, and results obtained have been more satisfactory when the wires were put on the last of June or early in July, and twisted very firmly about the cane.

While there is no proof that the vines are in any way injured (notwithstanding that very careful observations have been made for many years), it is not advisable to girdle the entire vine, but to treat only those canes to be cut away at the fall pruning, and leave about one-half of the vine to grow to a natural condition.

LIFE INSURANCE.[1]

I HAVE sometimes been a guest at public dinners when I have felt much more at home and at ease than I do now. The last time I was in this room, a few days ago, it was at a meeting of civil engineers, and I had a reasonable confidence that I had as much practice in public speaking, at any rate, as they had. But now, gentlemen, my experience with gentlemen connected with life-insurance companies is that they can talk a great deal more persuasively than I can.

My business and your business, gentlemen, are connected in a great variety of ways.

[1] A speech at the dinner of the Boston Life Underwriters' Union, April 9, by President C. W. Eliot of Harvard.

In the first place. I do not suppose there is any class of men who are more suitable persons to insure their lives than college teachers. They are almost universally poor, and they universally desire to educate their children and bring up their families well. They have a small, fixed income, and it is an income likely to last as long as their working power lasts. And then, again, they know that they generally live pretty long, to a time when their earning power is impaired; and against that time they make provision by endowment insurance. So I have happened to know a good deal about life insurance as seen from the point of view of a college man. For such reasons as I have given you, I am insured myself in three strong companies.

Again: a good many young men are absolutely without resources, but desperately bent on winning an education. Such a young man induces some friend to lend him a thousand or two thousand dollars, and take security in an insurance upon his life. That young man is presumably ambitious, and has a worthy ambition, and, if he has the necessary physique, he is likely to succeed; and to enable a few such young men to succeed in each decade is a great object.

I will mention still another service which I wish life-insurance companies could render. There may be — there are obviously — serious difficulties in the way; but perhaps here is an opening for new business. As your president has stated, it is the development, comfort, and protection of families that insurance chiefly provides for. Now, I have observed that the permanence of families in good station — the continued usefulness of families from generation to generation — can only be preserved in this country by education. Nothing else will answer: no inheritance of money will answer. You can read in the triennial and quinquennial catalogues how families live and die: some families continue to hold leading places in the community, and other families, which once held such places, disappear. The cause, almost uniformly, for their disappearance, is the ceasing of the higher education at some stage in the history of that family. Men who know these things, therefore (and college men are very apt to have their attention drawn to them), desire some means of securing education to their children. If nothing more, many of them would be greatly relieved to be sure that every one of their sons could get four or five hundred dollars a year for the years between eighteen and twenty-four, for instance. And it seems to me that this provision is not beyond the reach of life insurance; namely, that a father, when his boys are three or four years old, could be enabled to be sure that his boys, as they grow up, should have successively the three hundred or four hundred or five hundred dollars a year necessary to make sure of their education. It is a limited kind of endowment which is sought for, — an endowment which, in my judgment, would go very far to secure the stability and effectiveness in the community of families that have once reached a high state of education and cultivation.

I congratulate you, gentlemen, upon the sphere of your activity. I do not know of any business which has to do more exclusively with the best side of human life; and that is a very great pleasure and satisfaction in any man's life, that he has to do with human nature at its best. It seems to me, from what I have heard of the nature of life insurance and the kind of men with whom the agents of life-insurance companies are brought into contact, that my friend President Capen will be likely to tell you later that all life-insurance agents are Universalists. They must feel, I think, that at least all the men that they know who insure their lives are going to be saved.

It is a great privilege also, gentlemen, that your business in life is, after all, the promotion, as the president has said, of the security and happiness of family. I believe that the normal domestic joys are the chief sources of human happiness; and that, as the president has said, on the family rest all the larger human organizations. Therefore, when you work for the security and cultivation and safety of the family, you work for all that is most precious in human society.

THE sixth annual convention of the Association of Official Agricultural Chemists will be held at the Department of Agriculture, Washington, commencing Sept. 10, 1889, at 10 A.M.