

being lost in not fitting for the conditions in those lines where technical men are in demand.

At the afternoon session, the first paper was by Professor C. F. Burgess, of the University of Wisconsin, in which he recommended the appointment of a committee to compile a suitable list of books on various branches of engineering and applied science, for guidance to librarians in obtaining books for public and school libraries. The committee was subsequently appointed, to act with a similar committee of the National Educational Association. Such a list is greatly needed in order to encourage library committees to give more favorable consideration to the selection of works on engineering.

This paper was followed by a description illustrated by lantern slides of Houston Hall, University of Pennsylvania. Professor H. W. Spangler described the building, spoke of its stimulating effect on producing a healthy social environment and described the details of management which is practically under the student body. The next paper, by Professor C. L. Crandall, of Cornell, on "Modern Languages in Engineering Courses," evoked an extended discussion of their value as a culture study. Professor J. B. Johnson stated that the boys are now being crowded to the very limit, and better results might be obtained by substituting for the languages some of the more humanistic studies, as commercial geography and banking interests. Mr. Kent believed that these studies could be read by any one at almost any time, but languages could be mastered only by hard study. The general opinion was strongly in favor of French and German as requirements for graduation. It was suggested, however, that these could be studied before entrance, as was done in one of the Western universities.

The following are the newly-elected officers of the Society:

President, Robert Fletcher, Director of Thayer School, Dartmouth College, Hanover, N. H.

Vice-Presidents, Storm Bull, University of Wisconsin; C. M. Woodward, Washington University.

Secretary, H. S. Jacoby, Cornell University.

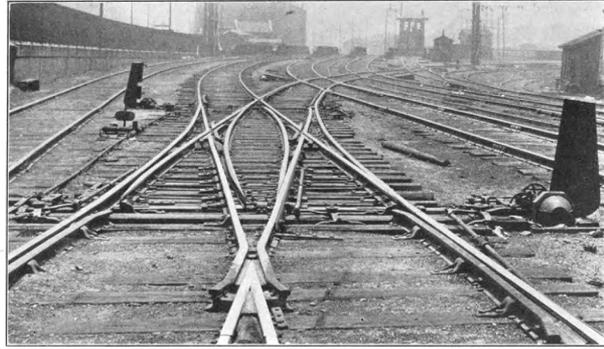
Treasurer, C. A. Waldo, Purdue University.

Members of Council: Until 1903, C. F. Allen, Massachusetts Institute; until 1904, W. F. M. Goss, Purdue; T. Gray, Rose Polytechnic; D. C. Humphreys, Washington and Lee University; O. H. Landreth, Union; W. G. Raymond, Rensselaer; L. E. Rober, Pennsylvania State; L. S. Randolph, Virginia Polytechnic Institute.

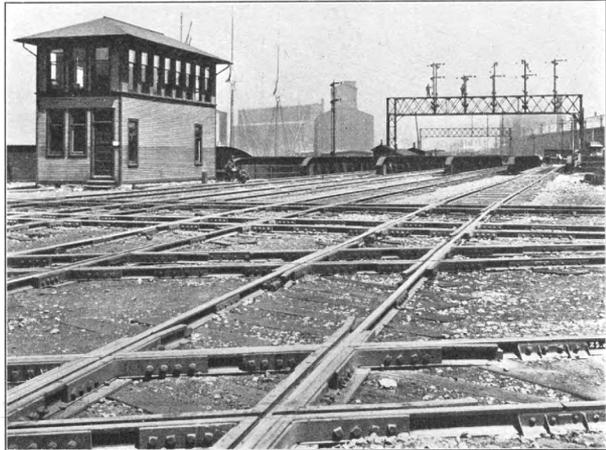
Electric Interlocking Near Sixteenth Street, Chicago.*

One of the largest interlocking plants ever installed in the United States has recently been completed by the Taylor Signal Co. of Buffalo at the crossings of the St. Charles Air Line and the Chicago, Madison & Northern with the Chicago, Rock Island & Pacific and Lake Shore & Michigan Southern near Sixteenth and Clark streets, Chicago, the arrangement of tracks, switches and signals being as shown on the accompanying diagram. It will be noted that eight bridges, spanning from two to six tracks, are used to support the high signals; also that a drawbridge is bolt-locked and signaled. The apparatus is the Taylor "all-electric."

There are approximately 150 regular train movements daily on the Chicago, Madison & Northern and St. Charles Air Line tracks and 700 on the Chicago, Rock



Slip Switches Worked by Taylor Electric Motors—Sixteenth Street, Chicago.
Looking South from "A." Motors Uncovered.



Electrically Operated Semaphore Signals—Sixteenth Street, Chicago.
Looking North.

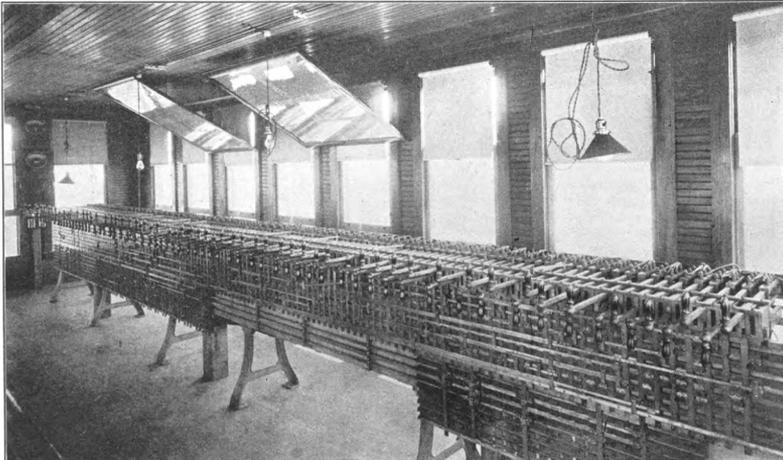
the proper movement of signals, switches, derails and locks, and the machine would be 75 ft. long if one spare space is allowed to each eight working levers. It would require at least three men constantly for its operation and probably four in the early morning and evening hours. The Taylor machine employed is 26 ft. long, and requires one man for its operation, except during the early morning and evening hours, when a "split-trick" man is used. Thus, in this Taylor plant, four eight-hour

of 55 cells each and of 150 ampere-hour capacity, these batteries being charged by a direct connected 2½-k.w. generator, driven by a 5-h.p. gasoline engine. Duplicate generators and engines are furnished to enable repairs to be made to machinery and batteries without affecting the operation of the plant, each engine and generator being capable of furnishing all the current required to charge the batteries and to light all the signal lamps. The switchboard is so arranged—that these lamps can be connected to either one of the two batteries or to either one of the generators, and also provides for connecting either of the batteries to either of the generators for charging or for connecting them to the interlocking machine, for the control and operation of switch and signal motors.

The levers are interlocked mechanically by cross-locking very similar to that used in the manual interlocking machines, the first part of a movement of a lever in either direction locking all other switch and signal levers, the movement of which would set up a route conflicting with the new position of the switch or signal controlled by this lever. The intermediate part of the movement effects the change of the circuit controller, which is attached mechanically to the lever, from the "normal" to the "reverse" position or vice versa. The final part of the movement releases other switch and signal levers whose movements help in setting up the route, and would conflict with the original position of this particular switch or signal. The lever is stopped at the end of the intermediate part of its movement in either direction by a latch. This latch is forced into place to lock the lever by a cam on the lever itself so that the lever is certain to be stopped by the latch as anything that could prevent the latch going into place would stop the lever by means of the cam. The latch is disengaged at the proper time by an electro-magnet energized by a current developed by the switch motor acting as a generator after it has performed its work of moving and locking the switch, or by the signal motor when the signal is put back to normal.

The construction of the switch-operating machine is such that the preliminary part of the movement withdraws the bolt from the lock rod. This same part of the movement lifts the detector bar, which is the same as the bar used with manual switches. The intermediate part of the movement effects the transfer of the switch points from one position to the other, and the final part of the movement replaces the bolt in position to lock the switch and lowers the detector bar into place.

A mechanical clutch operates to disengage the motor from the rest of the mechanism at the time when the lock bolt is fully home. This prevents any shock to the



Taylor Electric Interlocking Machine at Sixteenth and Clark Streets, Chicago.
C., R. I. & P.; L. S. & M. S.; C., M. & N.; St. Charles Air Line.

Island & Pacific and Lake Shore & Michigan Southern tracks, in addition to which there is a very heavy switching movement; and as both the Chicago, Rock Island & Pacific and Lake Shore & Michigan Southern run many suburban trains, the movements over the crossing in the early morning and evening hours is especially heavy. A mechanical plant would require 160 working levers for

*For a more detailed description of the Taylor apparatus see the *Railroad Gazette* Sept. 28, 1900.

men handle the machine more easily than ten eight-hour men could handle a mechanical plant.

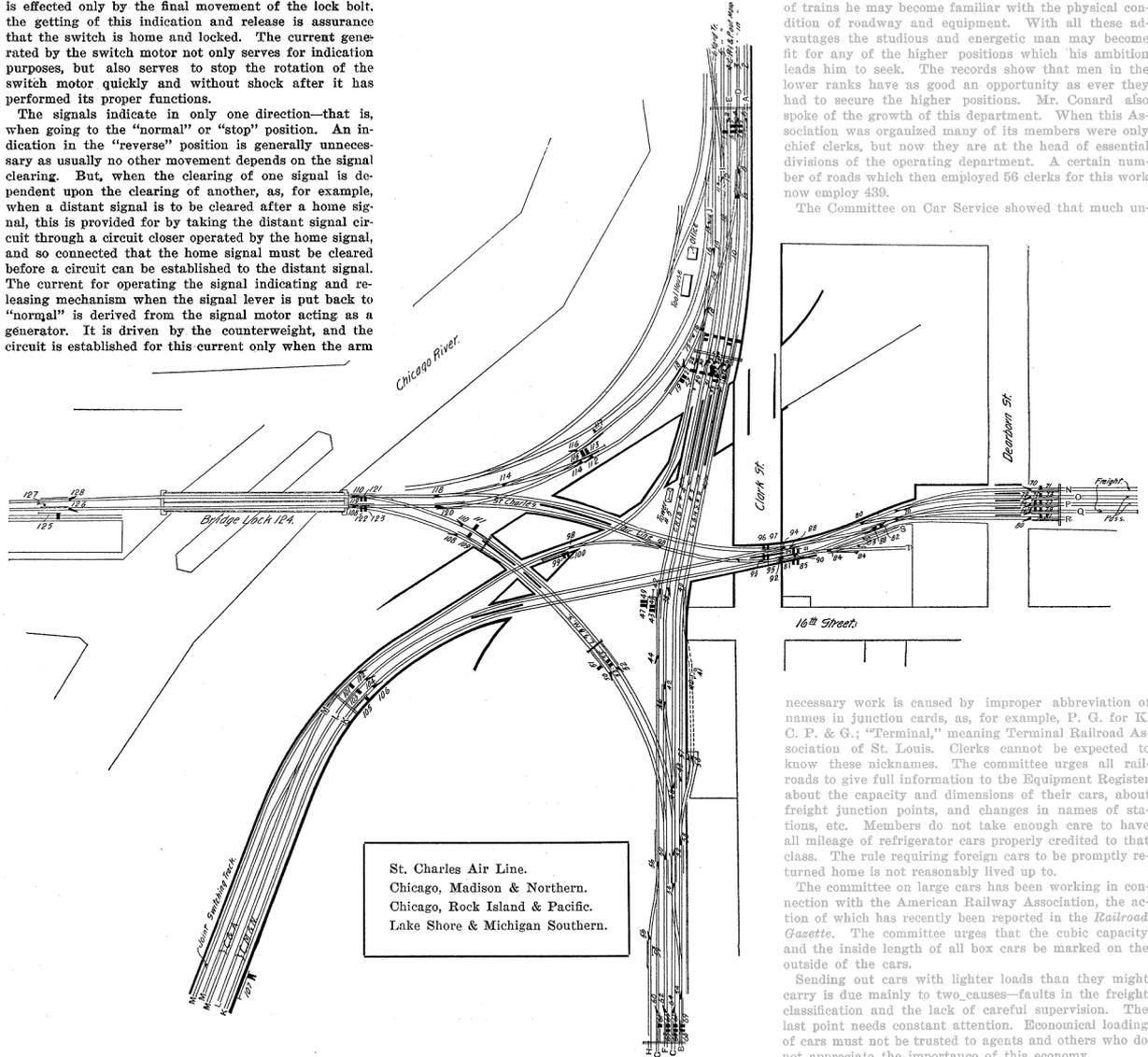
A feature distinguishing the Taylor from all other interlocking systems is that the sole power employed for effecting and controlling the switch and signal movements is electricity, and at this, as well as other large plants installed by the Taylor Signal Company, the signal lamps are lighted by electricity. The electric current is derived from storage batteries, there being two sets

machine, and leaves the armature free to rotate under the influence of acquired momentum. The final part of the movement of the lock bolt actuates a circuit controller, whose movement disconnects the motor from the source of power and establishes another circuit including only the motor and the indication magnet on the interlocking machine. The rotation of the armature due to momentum, develops a very strong current which energizes the indication magnet and thus disengages the latch from its connection with the cam on the lever, releasing the lever and permitting it to be moved into its final position. This method of indication and releasing the locking is another of the distinctive and valuable features of this system. It will be seen that, as the indication current is derived from the switch motor itself, and as this cannot be developed until the circuit controller at the switch is reversed, and as this reversal is effected only by the final movement of the lock bolt, the getting of this indication and release is assurance that the switch is home and locked. The current generated by the switch motor not only serves for indication purposes, but also serves to stop the rotation of the switch motor quickly and without shock after it has performed its proper functions.

The signals indicate in only one direction—that is, when going to the "normal" or "stop" position. An indication in the "reverse" position is generally unnecessary as usually no other movement depends on the signal clearing. But, when the clearing of one signal is dependent upon the clearing of another, as, for example, when a distant signal is to be cleared after a home signal, this is provided for by taking the distant signal circuit through a circuit closer operated by the home signal, and so connected that the home signal must be cleared before a circuit can be established to the distant signal. The current for operating the signal indicating and releasing mechanism when the signal lever is put back to "normal" is derived from the signal motor acting as a generator. It is driven by the counterweight, and the circuit is established for this current only when the arm

signal at "clear," and, assuming the signal to be held clear two minutes on an average, this will amount to 15 ampere-seconds, or a total for each signal movement of 19 ampere-seconds. Assuming a thousand train movements at this place daily and an average of four switch and two signal movements per train, it would require 33.88 ampere-hours of current per day.

At this rate, one set of batteries would last on one charge about four and one-half days. With the ordinary usage the batteries will have their efficiency is about 75 per cent., and the efficiency of the generator 80 per cent. It will require, then, about 8½-h.p. hours to store up this 33.88 ampere-hours of current at a total cost for fuel of nine cents; or at a cost of one cent for 444 switch and 222 signal movements. One set of batteries can be



Switches and Signals at Sixteenth and Clark Streets, Chicago—Apparatus Made and Installed by the Taylor Signal Co., Buffalo, N. Y.

has nearly reached the horizontal position. This current, besides its use for indication purposes, serves to stop the fall of the counterweight without shock.

The conducting wires of the Taylor system are enclosed in wooden trunking. The trunking is supported every 8 ft. on stakes a little above ground. It has been found by experience in electric block signaling extending over a number of years that this construction is reliable, and that the conductors are durable, and especially more durable than small galvanized pipes placed under ground.

In considering the cost of electric operation some figures may be interesting. It is found that the maximum current required to make a switch movement is seven amperes and the maximum time three seconds, or 21 ampere-seconds. It requires a maximum of four amperes for one second to reverse or clear a signal, or four ampere-seconds. It requires one-eighth ampere to hold a

charged in eight hours at the normal rate from one generator so that the engines need be run only eight hours in four and a half days.

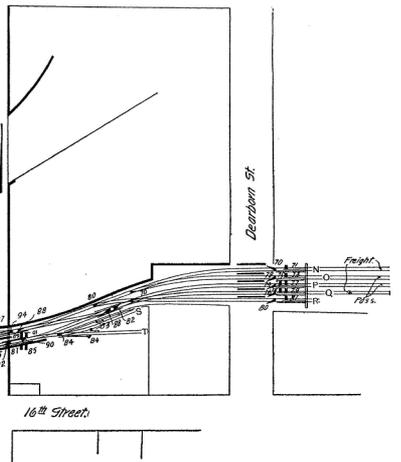
Owing to the fact that the engines are used but little, and under favorable conditions, they require little attention, and are run and looked after by the leverman or signal repairman.

Because electrical energy is used in the operation of the plant, it is possible to light the signals with electricity without additional apparatus, thus saving the expense of the care and lighting of the lamps. On account of the nature of the power employed, the switches and signals at a great distance are handled, and the indications are returned as quickly as from those near the tower. Of course, larger wires have to be used to the distant functions, but it is thoroughly practicable to get these results at a reasonable cost, while with any other form of power transmission it is not practicable.

Car Accountants' Convention.

The 26th annual convention of the International Association of Car Accountants was held at Detroit June 19 and 20. Papers were read by Messrs. G. P. Conard and W. H. Rosevear, and reports were made by the committees on car service, on large cars and on light loading of cars. Mr. Rosevear's paper consisted of reminiscences, which were much enjoyed by his hearers. Mr. Conard enlarged upon the usefulness of the car accountant and his excellent opportunities. The man in charge of car service gets a comprehensive view of the whole of the operations of his railroad. He is compelled to become thoroughly posted in geography, and he learns all about the flow of different kinds of traffic; he may learn the local conditions all over his own road, get experience in station and yard work, and in studying the make-up of trains he may become familiar with the physical condition of roadway and equipment. With all these advantages the studious and energetic man may become fit for any of the higher positions which his ambition leads him to seek. The records show that men in the lower ranks have as good an opportunity as ever they had to secure the higher positions. Mr. Conard also spoke of the growth of this department. When this Association was organized many of its members were only chief clerks, but now they are at the head of essential divisions of the operating department. A certain number of roads which then employed 56 clerks for this work now employ 439.

The Committee on Car Service showed that much un-



necessary work is caused by improper abbreviation of names in junction cards, as, for example, P. G. for K. C. P. & G.; "Terminal," meaning Terminal Railroad Association of St. Louis. Clerks cannot be expected to know these nicknames. The committee urges all railroads to give full information to the Equipment Register about the capacity and dimensions of their cars, about freight junction points, and changes in names of stations, etc. Members do not take enough care to have all mileage of refrigerator cars properly credited to that class. The rule requiring foreign cars to be promptly returned home is not reasonably lived up to.

The committee on large cars has been working in connection with the American Railway Association, the action of which has recently been reported in the *Railroad Gazette*. The committee urges that the cubic capacity and the inside length of all box cars be marked on the outside of the cars.

Sending out cars with lighter loads than they might carry is due mainly to two causes—faults in the freight classification and the lack of careful supervision. The last point needs constant attention. Economical loading of cars must not be trusted to agents and others who do not appreciate the importance of this economy.

The committee recommends that train reports sent to car record officers should show the weight of the lading in the cars.

The President of the Association for the ensuing year is Mr. O. W. Stager (P. & R.), Philadelphia; Secretary, L. G. Corcoran (P. R. R.), Buffalo, N. Y.

Foreign Railroad Notes.

The French slope of the Pyrenes is cut up by long, narrow valleys, some of which have extraordinarily attractive scenery and are much frequented by tourists. In one of these two electric mountain railroads have been recently opened, both having their connection with the steam railroad at Pierrefitte, near Lourdes, and extending thence one to Cauteret and the other to Luz, where there are famous hot springs.

The gates at level crossings in Belgium have been