the dynamometer car struck it at a speed of 13½ miles per hour. The apparatus in the car recorded 381,704 lbs., which was its limit. What the actual shock was cannot be told. A coupler was broken and some slight additional damage was done. The car was new, which doubtless explains the small damage done.

From the general results of the tests covered by tables 1 and 2 it is believed that the tensile stresses in draft gears with careful handling will frequently reach 50,000 lbs., with ordinary handling 80,000 lbs., and with decidedly rough handling fully 100,000 lbs., while the buffing stresses can be placed at 100,000, 150,000 and from 200,000 to 300,000 lbs. respectively. In extreme cases the buffing stresses will go considerably above the last named figure. It will undoubtedly require more extensive tests to determine whether these figures need modification, but it is evident that the tests give us a more definite idea of the stresses which draft gears and sills must stand than we have been able to obtain heretofore. Continued investigation along these lines should finally result in a sufficient amount of information to permit of a more exact method in the designing of draft gears.

We think the figures show the necessity of something better and more effective than the spring draft gear so commonly used. It would be reasonable, in view of the above figures, to require draft gears and underframes to be capable of withstanding tensile stresses of 150,000 lbs., and buffing stresses of 500,000 lbs., and it is evident that the present spring resistance is inadequate. Whatever one may think of the details of the various friction draft gears, it must be evident that in the character and amount of resistance they are superior to the spring gears.

Some figures have been published from time to time showing the cost of repairs to draft gears. With a view of showing not only how much it cost to maintain the draft rigging, but also the end sills, center sills, and all other longitudinal sills of wooden cars, and to what extent a railroad would be justified in increasing the first cost of such parts, to save money in maintenance, an attempt was made to collect these figures from the accounts of a certain road. This was done by taking the cost of the repairs to such parts on the company's cars while on its own road and adding to those figures the cost of repairs to these parts as billed against the company by foreign roads; but as these bills included only the repairs for which the owner is responsible, and not the more extensive damages for which the user is responsible, the figures are of no value, particularly as the cars of the road keeping these figures made a large mileage on other lines. If, however, such costs could be obtained with accuracy they would not only throw some light on the question of draft gears, but might also indicate to what extent we are justified in increasing the first cost of cars through the use of steel center sills, steel sub-sills for the draft rigging, or steel underframes.

When the committee began its work it was expected that it would be able to present some figures on costs that would show if some construction other than the wooden underframes on the one hand and the expensive steel underframes on the other would not be justified, such, for instance, as the use of steel center sills or steel sub-sills under wooden sills, as it is evident that the greatest damage to the present wooden underframing occurs from the shocks transmitted through the draft rigging. While disappointed in not being able to go very deeply into this portion of the subject, it is thought the information obtained from the road tests mentioned was of sufficient value to warrant its presentation without further delay.

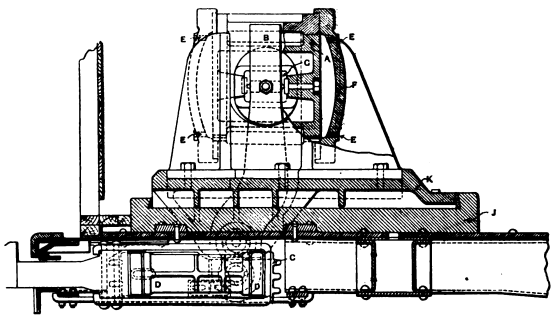

Fig. 1.

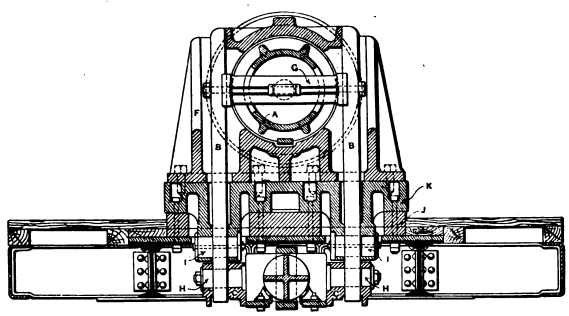

Fig. 2.

DISCUSSION.

This report was received too late to be sent out to the members and copies were distributed at the meeting. The time for consideration of the report having been so short, the discussion was correspondingly brief. Some extracts follow:

Mr. J. A. Carney (Chicago, Burlington & Quincy): It seems to me that this question of draft rigging as a whole is dependent on the entire underframing of the car. A case has been brought to my notice quite recently where we put on a very improved method of double-spring draft rigging which was strong enough to stand ordinary shocks. We found that the whole draft rigging pulled away from the sill, breaking the sills in two. Whatever additional strength we may give to our couplers or draft rigging, we have got to put an equal amount of strength into the body of the car.

Mr. E. M. Herr (Westinghouse Air-Brake Co.): I had the pleasure of riding on the dynamometer car in some of the tests recorded in the committee's report, and can say that I was also surprised, as several of the members have expressed themselves, at the magnitude of the shocks and blows that were delivered in ordinary train operations. As explained in this report, the maximum strains are very difficult to get in the dynamometer car, as of course it can occupy only one point in the train, which may not at all be the point of maximum stress. As a matter of fact, the maximum tensile stress recorded in all the dynamometer tests, but which is not shown on the report, was close to 109,000 lbs., if I remember right, but the buffing stresses ran frequently over 300,000 lbs., not, however, in normal train operations.

The manner of handling the equipment when friction gears are applied has been spoken of as being more severe. This is probably true, but the results show that despite more severe handling there is less damage to equipment. The instances in which trains were handled on the two roads, one with friction gear and one with spring gear, indicated that it was entirely possible to handle the equipment with friction gears in a way spring gears would not admit of. It has enabled engineers to take runs on hills through sags with the assurance that they would not break in two, while, of course, with other gear the damage would have been very great.

President W. F. M. Goss: I would like to ask Mr. Herr whether in reducing these maximum buffing stresses the pen on the dynamometer car would go up and stay up, or whether it was merely an instantaneous movement of the pen? Was the heavy force, when recorded, sustained, when running into the higher figures?

Mr. Herr: Generally it was not; the heaviest blows were never sustained; they were in the nature of a sudden blow, just as you feel it when you are on the car; it comes with a great suddenness and is over, and the record showed that generally, with several lower indications, the blows below 100,000 lbs. were frequently sustained, but above 100,000 I do not think ever entirely sustained and very rarely sustained at all; it nearly always occurred as a blow and was immediately relieved.

The President: Under those circumstances, Mr. Herr, is it judged that the dynamometer record is a correct record, or is it merely indicative?

Mr. Herr: That I can hardly answer. It seems to me that the dynamometer record, if anything, is always the actual stress. Of course there is a certain amount of inertia in the mechanism of the dynamometer which would tend to reduce the effect upon the liquid that is used as a medium.

[The tabulated data of these tests which accompanied this report are of but moderate interest aside from the characteristic records in some particular cases. We append four tables, compiled from those presented by the Committee which give some of the most characteristic records in both tension and buffing on the Lake Shore & Michigan Southern and the Bessemer & Lake Erie. No convincing comparison can be made between the two types of draft gears from the data obtained.

The dynamometer car of the Westinghouse Air-Brake Co., referred to by the Committee as used in making the tests, has a nominal capacity of 300,000 lbs. with an actual capacity as shown in one record of more than 380,000 lbs. Figs. 1 and 2 show a side elevation and end section of the hydraulic pressure cylinders and their attachment to the coupler and the car. As first designed a friction draft gear was inserted between the followers DD, but in these tests this was replaced by a solid casting. The heavy steel casting C replaces the usual draft timbers and follower stops, and transmits the stress through the trunnions HH, to the levers BB. These fulcrum about II, two heavy pins secured to the sub-base K. A casting G is bolted between these two levers and carries the knife edges which bear against the hardened plates set in the movable pressure head A, which is made in one piece. The trunnion bearings are four point roller bearings designed to eliminate friction and to keep the points of contact always in the same relative positions.

The base plate J, is bolted and keyed to the heavy steel plate which extends the width of the car and is securely riveted to all the frames. The sub-base K is keyed to J and the cylinder casting F is in turn bolted to it. This gives a very rigid fastening and admits of no looseness, destructive to accurate measurements.

When any pressure is applied at the coupler it is transmitted through the followers to the casting C, and to the levers BB. These move either forward or backward as the pressure is compression or tension and exert pressure on the head A. This is transmitted through ½ in. pipe, tapped into the cylinder at EE, to the indicators, similar to the ordinary steam engine indicator. There are two of these mounted on either edge of the roll of paper, one connected to the forward cylinder for registering compression and the other to the rear cylinder, registering tension. The paper is moved under the pencils by clockwork, independent of the movement of the car. An electrical make and break on the car axle records the revolutions on the paper and seconds are recorded by a chronograph. To make the apparatus sensitive, both indicators were kept under a pressure indicating 8,000 lbs. for which a correction was made in the datum lines. The apparatus was calibrated by means of carefully calibrated springs before the tests and a number of times during the tests without any appreciable variation.

The car has pressed steel underframing and was designed to withstand very heavy shocks. We are indebted to Mr. E. M. Herr, General Manager of the Westinghouse Air-Brake Co., for the drawings and description of the dynamometer car.]

Suburban Annex, Chicago & North Western Station.

A depot for suburban service, to be built as an annex to its present Wells Street Station in Chicago, has been begun by the Chicago & North Western. The present terminal facilities have for some time been inadequate to handle the volume of passenger business and the improvement now being made is expected to relieve the pressure somewhat. The plans for the building, prepared by Frost & Granger, Chicago, show a two-story and basement structure, following the architecture of the present station building. It will be red brick with stone trimmings and slate roof. The location is south of the present station, between the latter and the Chicago River, with a frontage on Wells street of 156 ft. 6 in. and a width of 58 ft. 2 in.

The foundations have a footing course of concrete laid over with block rubble. The suburban waiting room floor is carried by a double row of cast-iron columns, spaced 18 ft. centers and supporting I-beams running both longitudinally and transversely, the former 15 in. deep and the latter 8 in. The basement floor, which is at the track level, is laid with brick on concrete. This floor will be used for baggage rooms and trainmen's quarters.

The suburban waiting room will be 54 x 153 ft., having a main entrance from Wells street, 30 ft. 6 in. wide, opening into a broad vestibule, separated from the main room by swinging doors, between ornamental metal mullions. This room is to be finished into the roof and has a clear height of 24 ft. under the trusses, which are timber with round-iron ties, and an additional height of 26 ft. to the crest of the roof. Under the extremities of each truss and extending down some 8 ft. are to be carved wooden cornices. The room has a wooden floor and the finish is plaster, above a wooden wainscoting, the plaster extending to the crest of the roof. Provision will be made for suburban ticket offices, and news and cab stands, in addition to the accommodations for passengers.

Connection to the main station is made from this floor through a vestibule 61 ft. 10 in. long and 21 ft. wide. It is carried by box girders resting on latticed columns, has glass sides and a concrete floor. The suburban tracks, which are at the west side of the building, are reached from the waiting room by four staircases, each 18 ft. wide; as there are eight tracks, this gives a stairway for each pair of tracks. Umbrella sheds will afford protection to passengers against rain.

The main station has nine tracks, all of which are required for through passenger service. With the eight which will be provided for suburban business there will be a total of 17 in the terminal. About 260 trains are handled at this terminal daily, some 200 of which are for suburban traffic.

A large transfer freight house of the New York Central at East Buffalo was destroyed by fire on the morning of May 23, together with 300 loaded cars.