symmetrically located observations were obtained as a check in every case where possible, in order to cover variations in the quality of the concrete at different points.

It should be remarked that the results from the use of the Berry extensometer are reliable only after the observer has had considerable preliminary practice with this instrument. The holes in the steel bars must be carefully reamed, the instrument must be protected from the heat of the hands, and the contact points must be seated under uniform pressure. Observance of these requirements, multiplied observations, and frequent reference to the standard calibration bar, are the conditions of success.

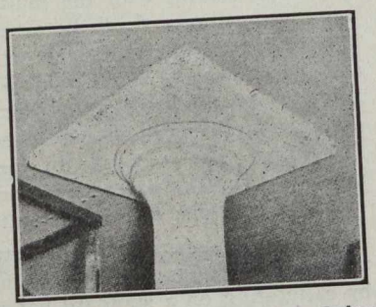

Fig. 2.—View of Slab from Below, Showing Column Capital and Several of the Gauge-Points.

(At the time these pictures were taken the four panels shown carried 20% overload)

The conditions were exceptionally favorable to a satisfactory test. The building was practically completed at the time of test. The temperature varied but little, being about 74° at the start of the test, dropping gradually and uniformly to 70°, and rising again at the end to 74°. The slab was poured on June 23, 1911, and was 64 days old when the maximum load of 624 lb. per sq. ft. of panel area was placed upon it.

Loading.—The amount of loading was determined by the weight of the pig iron as recorded on the weigh bills delivered by the teamsters, and was checked by weighing a number of piles of pig iron from the test load on a platform scales.

The pig iron was piled on the floor in separate piers, each placed within a 2-ft. square, so that no arch action existed in the load itself to relieve the panel from movement. It was necessary to leave several of these squares vacant about columns and to leave an aisle between the columns to allow space for observations. (See view Fig. 3). The pig iron belonging on these vacant squares was distributed over the remaining squares of the same panel. It will be apparent that under this procedure the real load intensity, as affecting bending stresses and deflections, is the intensity of loading over the loaded area (about 90% of the panel area), rather than the nominal or average load over the entire panel area.

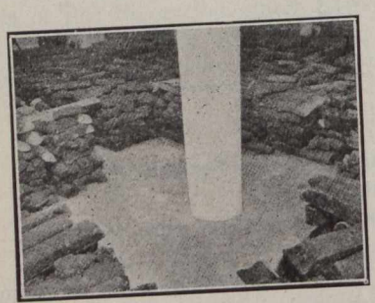

Fig. 3.—View of Slab with Pig-Iron Loading, Showing Space Left for Making Readings.

(At the time these pictures were taken, the four panels shown carried 20% overload)

All gauge-lengths were measured and checked throughout before loading was started. When the loading reached certain amounts, distributed evenly over four panels, it was discontinued and allowed to stand for six hours before the observations were made and the loading resumed.

The increments of load at which measurements were made were as follows: 75, 150, 256 (the design load), 312 (intensity 359), and 624 (intensity 717) lb. per sq. ft., the latter load being applied only to two panels adjoining diagonally. Readings were also taken with 256 on two diagonal panels and 312 on the other two panels, and with 468 on two diagonal panels and 156 on the others, but without waiting for the six-hour interval to elapse before taking readings.

The total number of complete observations over single gauge-lengths was over 2,000, and the total individual readings over 10,000. The test occupied one week's time.

Stresses.—The stresses were determined from the observed deformations by using a modulus of elasticity of 30,000,000 lb. per sq. in. for the steel, and 4,000,000 lb. per sq. in. for the concrete. The latter value was determined from tests of three concrete prisms poured from the concrete in the test slab and tested at Purdue University at an age of 77 days.

Load-deformation curves were plotted for each observation point, the known nature of the curve under flexure being used as a basis; typical curves are shown in Fig. 4 herewith. The dead-load stress has been taken from these curves as equal to the stress caused by an equal live load.

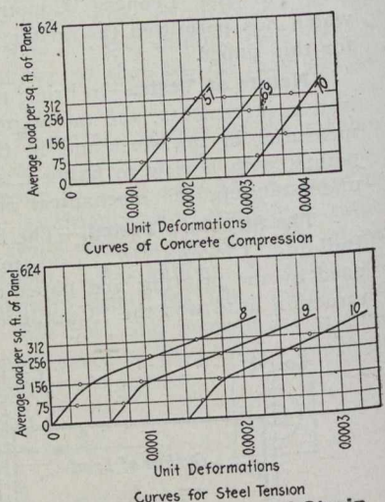

Fig. 4.—Typical Load-Strain Curves from Tests in Franks Building.

The table below gives a summary of the corrected values of the total dead- and live-load stresses found from the various groups of observations. The detailed summary of individual stresses at the various observation points is omitted in this paper.

Comments on the Results.—The writer is not prepared at the present time to state the significance of the results obtained with respect to the mechanics of this form of construction. Such statements would be somewhat speculative, and should be separated from the report of test, which is one of measured facts.

The Slab Design.—As compared with the design requirements of the Chicago Building Code, it is interesting to note that at design load the highest average stress in the steel is 5,078 lb. per sq. in. (average of observations 11, 12 and 13), while the highest average compressive stress in the concrete is 677 lb. per sq. in. On the basis of safe working stress in the steel of 16,000 lb. per sq. in., and in the concrete of 35% of the ultimate strength (which averaged over 3,250 by tests of prisms) or 1,100 lb. per sq. in., it appears that the steel is stressed to 31% of its safe load, while the concrete is stressed to 62% of its safe load. It

Table of Actual Stresses Observed in Test of Franks Building.

All stresses are the final values for total dead and live-load, and are given in pounds per square inch.

Average of Observations Nos.	Description	Live-load, lb. per sq. ft. 256	312	624
STRESSES IN SLAB RODS				
5, 6, 7, 14, 15, 16	Center of span, diagonal band	1071	1920	6950
8, 9, 10, 11, 12, 13	Center of span, cross band	4539	6140	10095
31, 32, 33, 34, 35, 37	Over capital at center column, diagonal band	3440	4350	9280
27, 28, 29, 30	Over capital at center column, cross band	4575	4840	8140
21, 22, 23	Over capital at corner column, diagonal band	1920	2280	7540
24, 25, 26, 41, 42, 43	Over capital at side column, cross band	2690	3138	5315
COMPRESSIVE STRESSES IN CONCRETE				
56, 57, 59, 60, 68, 69, 70	On slab at center column	560	650	1206
61, 62, 65, 66	On drop at center column	677	778	1685
51, 74	On drop at corner column	318	370	1515
52, 53, 73	On slab at corner column	329	378	650
54, 55, 71, 72	On slab at side columns	189	217	420
MAXIMUM BENDING STRESSES IN COLUMNS				
104	Compression in concrete, corner column	680	840	1660
109	Compression in concrete, side column	416	512	1000
84	Tension in steel, corner column	4980	6000	11620
99	Tension in steel, side column	2220	2640	5880
DEFLECTIONS IN INCHES				
121, 124	Center of panel—at 6 hours	0.123	0.156	0.475
	Center of panel—at 24 hours			0.500
	After standing unloaded 6 hours	0.142		
	After standing unloaded 2½ days	0.091		

Note: The loadings of 256 and 312 pounds per square foot were on four adjacent panels. The loading of 624 lb. per square foot was on two panels adjoining diagonally.