CHAPTER IV

EXPERIMENTS ON THREE RECTANGULAR PORTAL FRAMES WITH SPECIAL FITTINGS ATTACHING THEM TO PINNED BASES

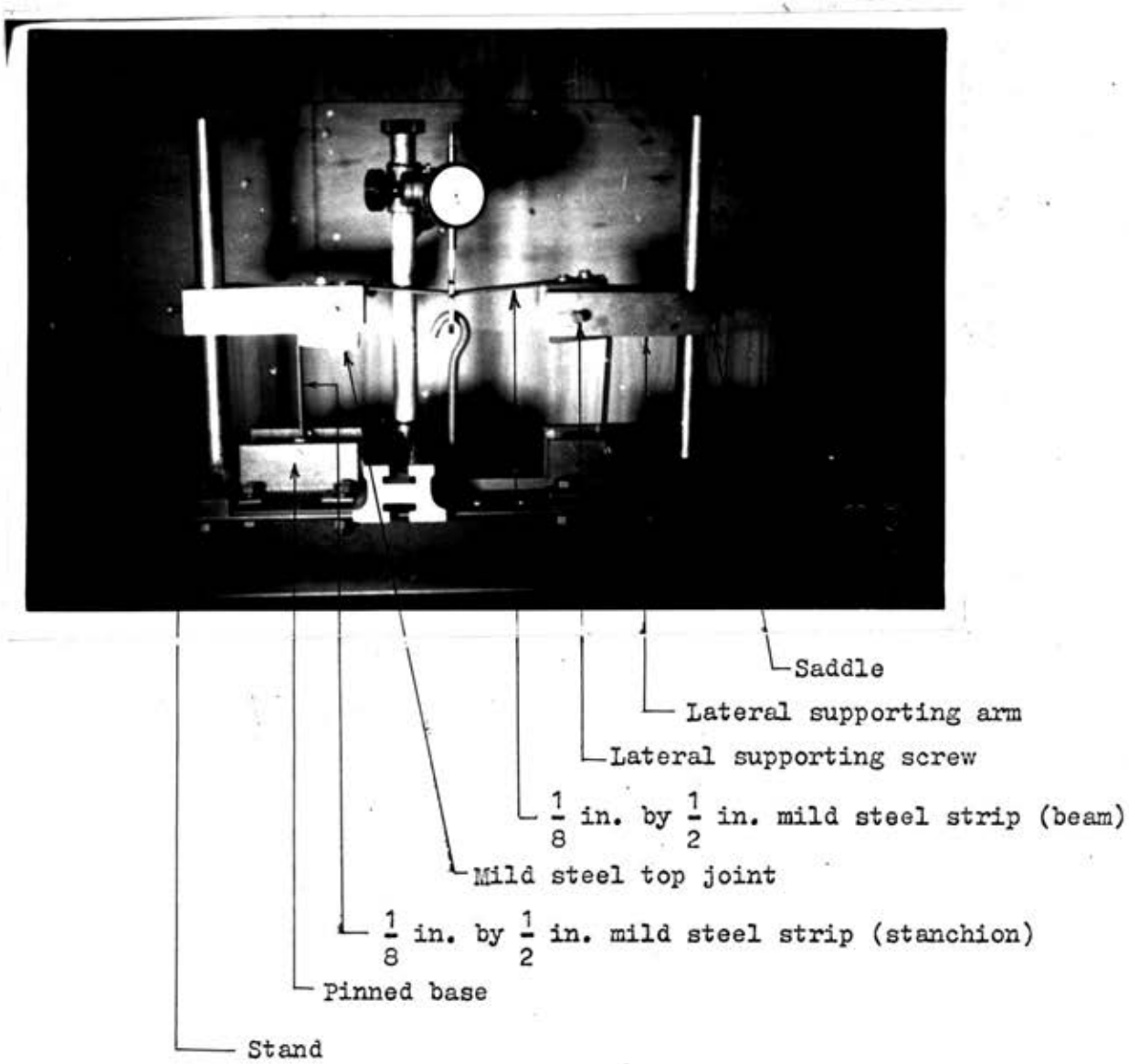

Fig. 4.1. - The arrangement of experiment 4

Description of apparatus

The top joints of the frame shown in Fig. 4.1 each consist of a 2 in. by 2 in. mild steel bar. Holes are tapped and the $\frac{1}{8}$ in. by $\frac{1}{2}$ in. strip can be connected by screws. By this means a positive. rigid joint is achieved, and the joint fittings remain undamaged after the collapse of the frame, enabling them to be used again and again.

In order to eliminate any instability of the frame during loading, the two clamps shown in Fig. 4.3 are used. Each clamp consists of a saddle sliding on a vertical column which is bolted regidly to the test bench. Hexagonal bolts in the saddle can be adjusted to prevent the side-sway of the frame taking place as the load is increased, and lateral support is given to the top joints by means of the strip and bolt attachments to the saddle. The frame and clamps are detailed in Figs. 4.2 and 4.3.

Fig. 4.4 shows an elaborate pin fittings of the base of each stanchion in detail. In this case there is no need to twist the steel strip.

Discussion of results

The percetage deviations of the collapse load obtained were as large as those in Chapter IV[1]. The plastic hinges were also formed at

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[1]W. Tee, Simple Experiments on Plasticity,(A project report submitted in partial fulfillment of the requirements for the Advanced Diploma in Mechanical Engineering, Graduate School, Chulalongkorn University, Bangkok, 1967-68).

Table 4.

Results of experiment 4

Portal frame	Dimensions (in.)		Collapse load (lb.)			Error %
			Theoretical		Experimental	
	Width	Depth	Uncorrected	Corrected		
AI	0.499	0.126	97.2	95.2	89	6.52
AII	0.505	0.123	93.5	92.4	85	8.01
AIII	0.504	0.123	93.1	91.6	83	9.39

the same places (one at the mid-span of the beam, and the other two in the stanchions just below the top joints; see Fig. 4.5b). Thus, it may be concluded that the results obtained from a portal frame with pinned bases, using either the twisted stanchions or the fittings at bases has the same standard of accuracy. However, the latter is far more stable and easy to work with.

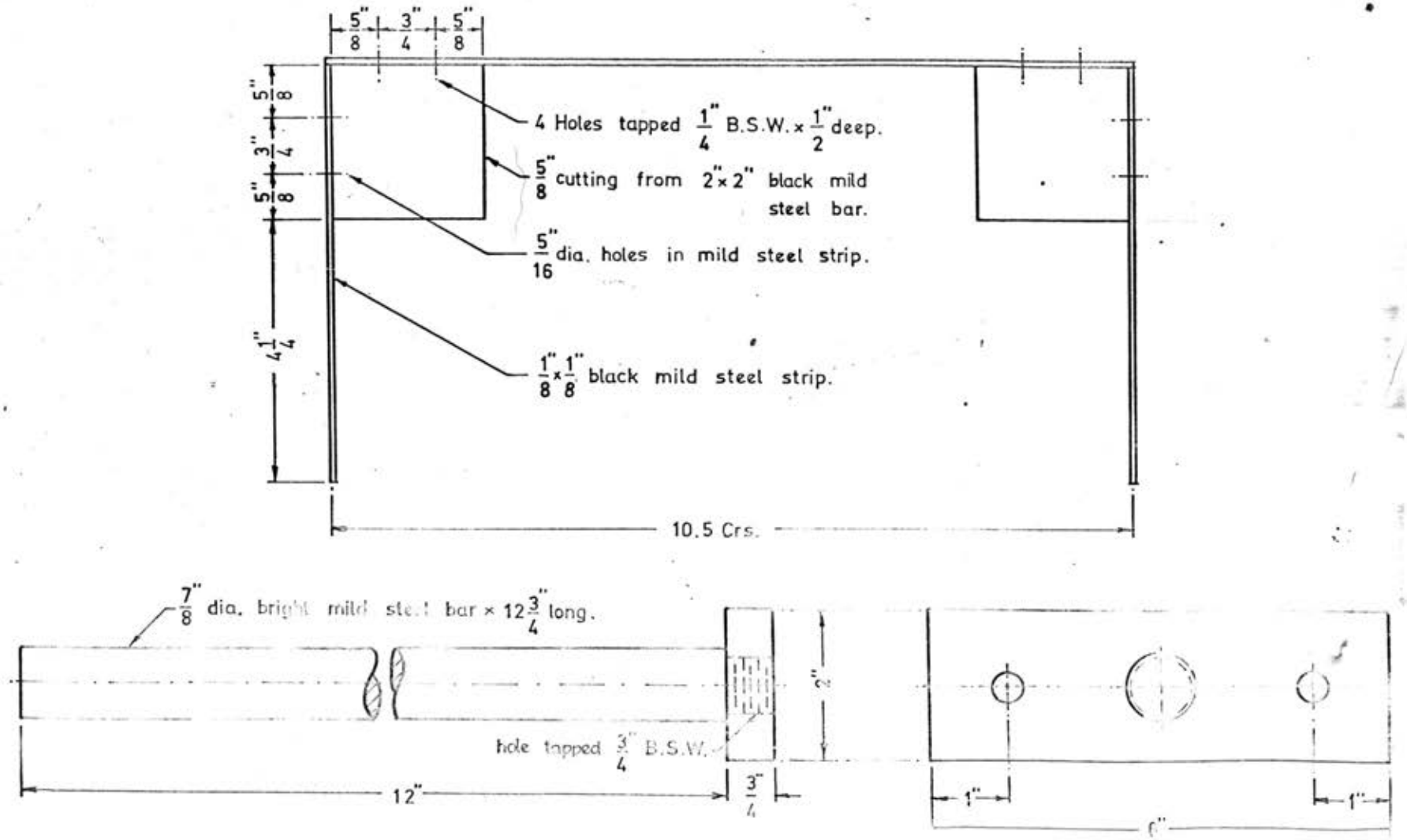


Fig. 4.2 — Details of frame and stand

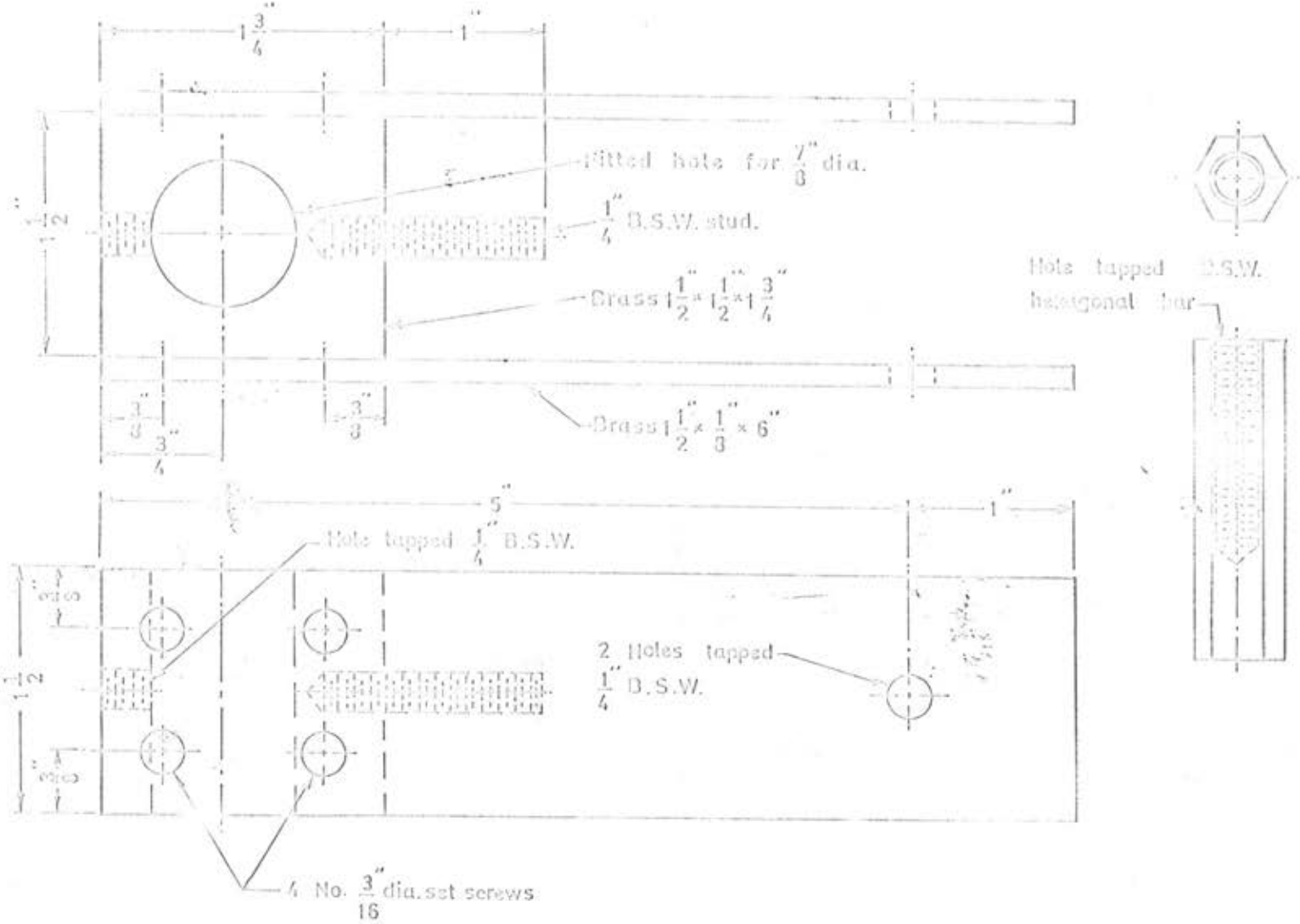
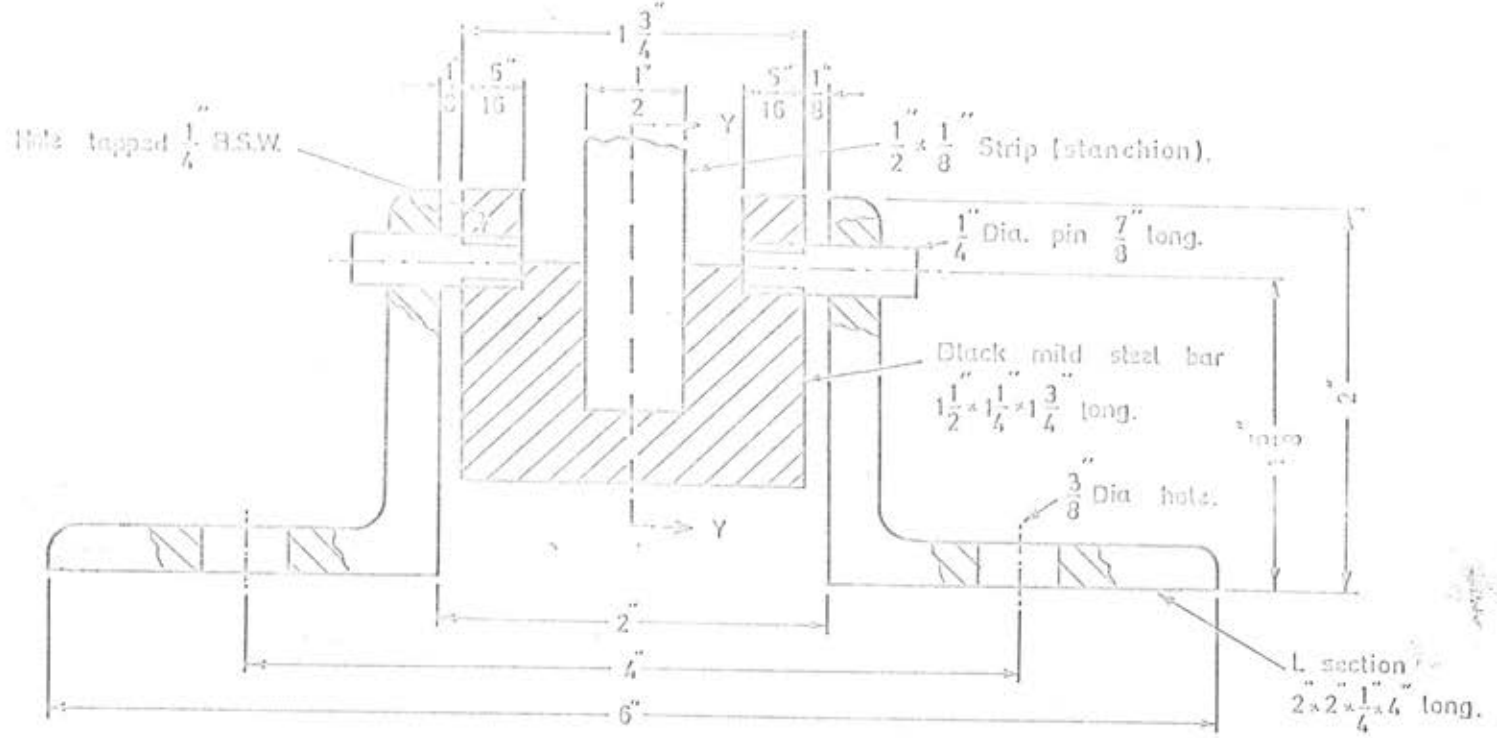
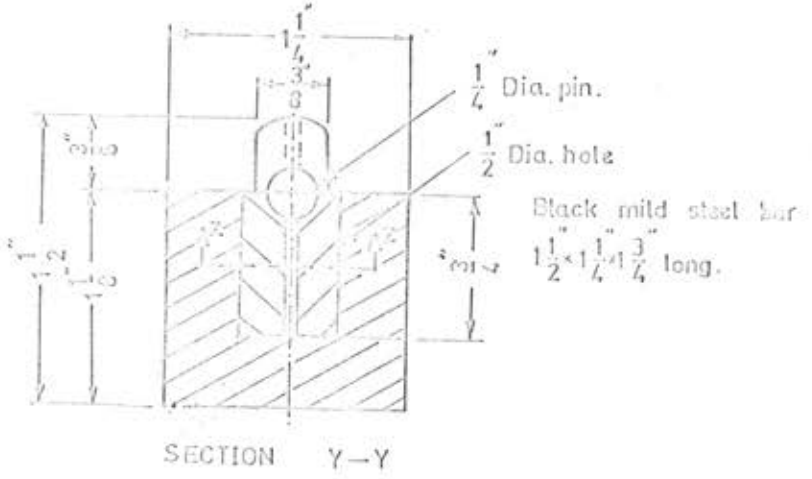
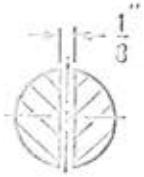


Fig. 4.3. — Details of clamps.

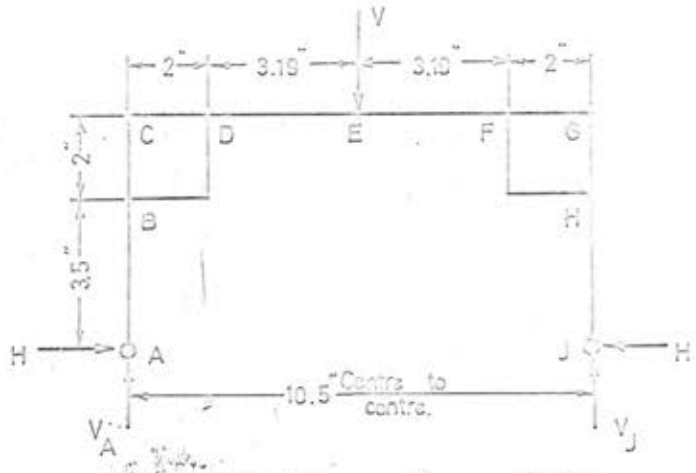




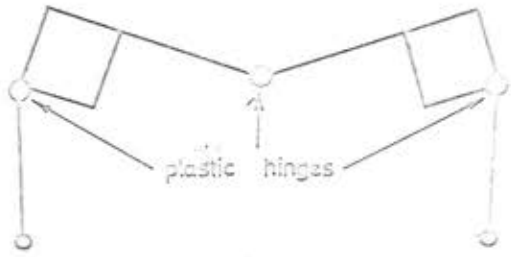


REQUIREMENT	QUANT.
L section 2" × 2" × 1/4" × 4" long.	4
Black mild steel bar 1 1/2" × 1 1/4" × 1 3/4" long	2
1/4" Dia. pin × 7/8" long.	4
Shims 3/4" long cut from 1/2" dia. bright bar.	4

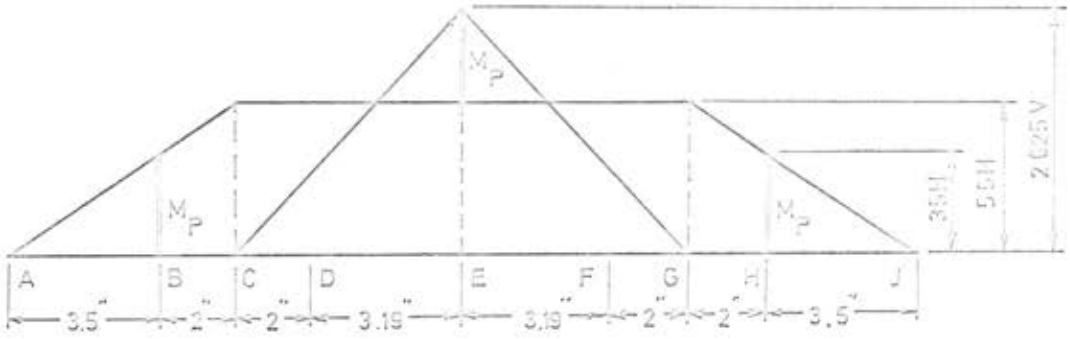
Fig. 4.4. — Details of pinned bases.



(a) Dimensions of frame.



(b) Modes of collapse.



(c) Collapse moment diagram.

Fig. 4.6.

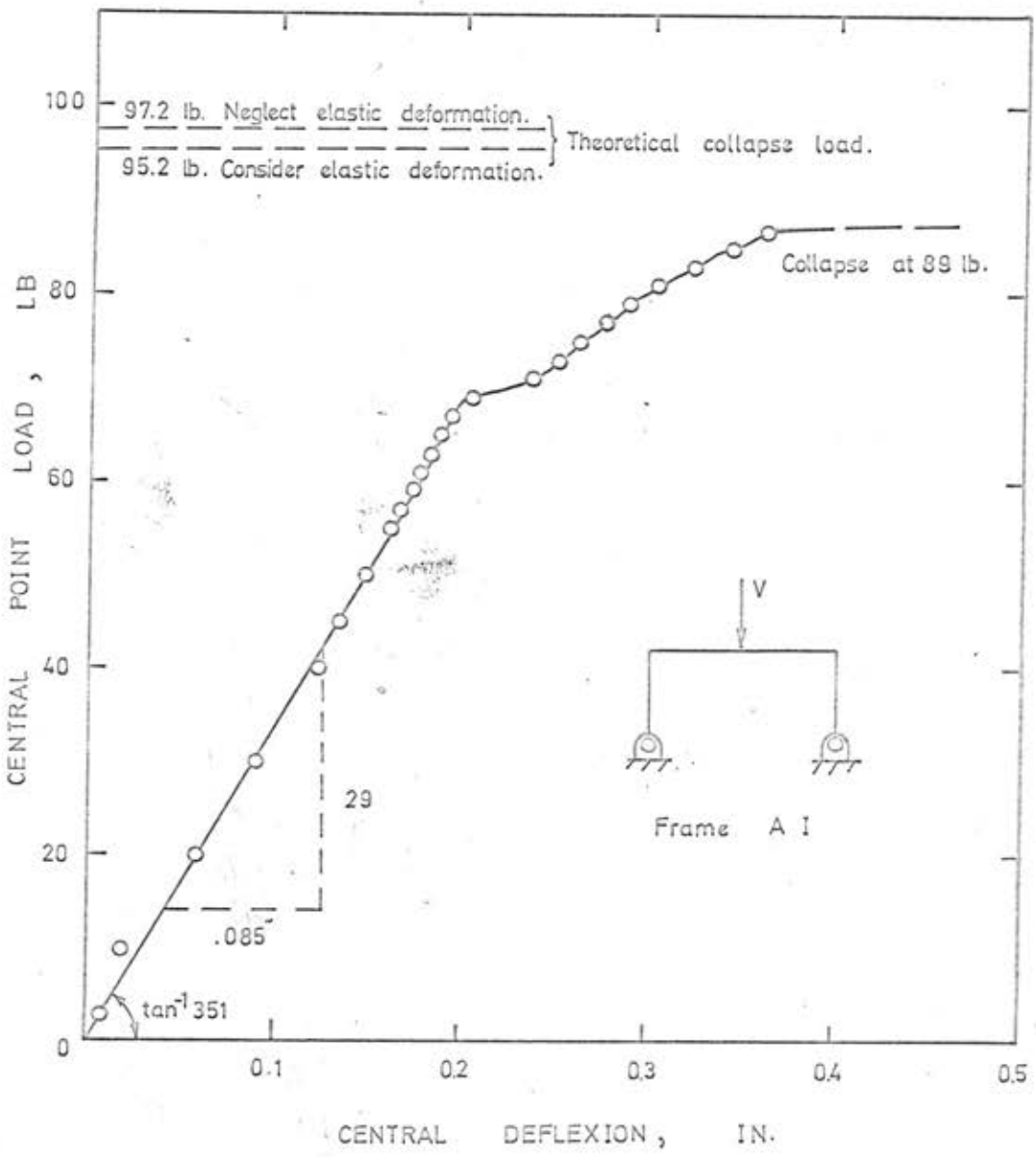


Fig. 4.6.—Central Load – Deflexion Curve of Rectangular Portal Frame with Pinned Bases, Special Fittings at Bases of Stanchions.

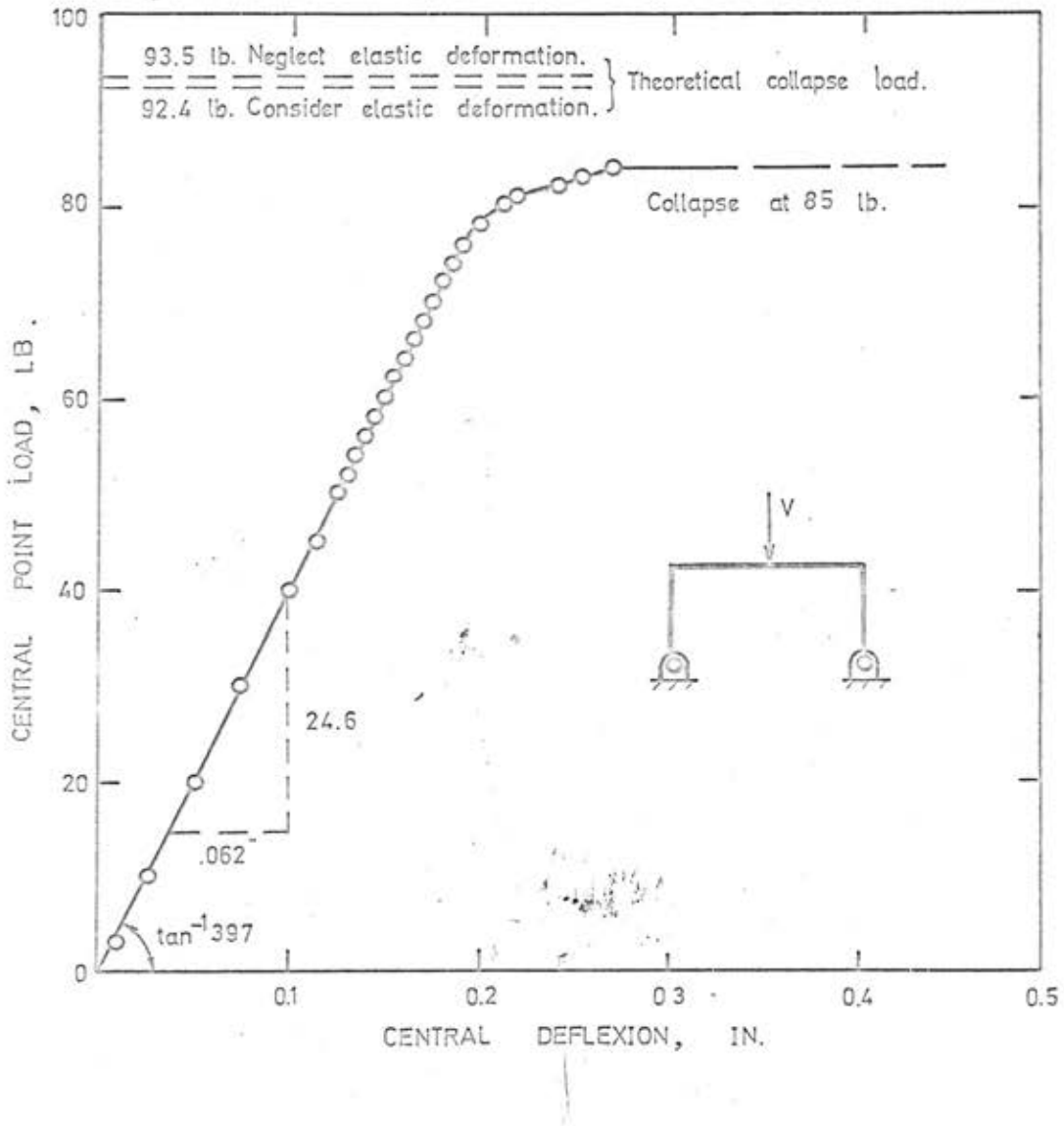


Fig. 4. 7.— Central Load – Deflexion Curve of Rectangular Portal Frame with Pinned Bases, Special Fittings at Bases of Stanchions.

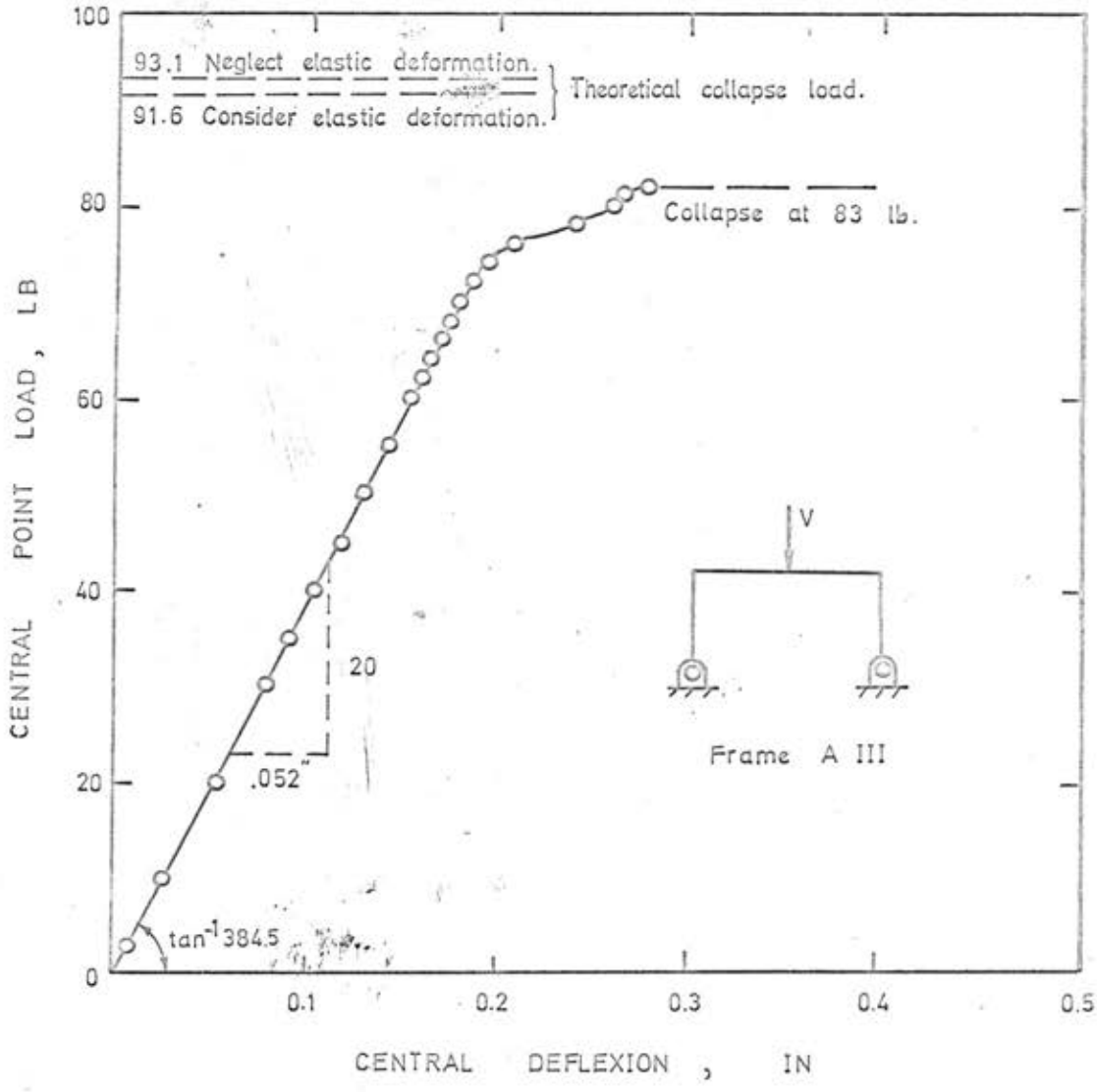


Fig. 4.8.— Central Load – Deflexion Curve of Rectangular Portal Frame with Pinned Bases, Special Fittings at Bases of Stanchions.