TABLE 2—DATA FROM LOAD/ELONGATION CURVES (INSTRON) FOR BENT PAPER

| *Paper 170 g/m²* | *Machine-direction* | | *Increase or decrease on bending, per cent* | *Cross-direction* | | *Increase or decrease on bending, per cent* |
|---|---|---|---|---|---|---|
| | *Unbent* | *Bent* | | *Unbent* | *Bent* | |
| Young's modulus, dyn/cm² | $4.4 \times 10^{10}$ | $2.8 \times 10^{10}$ | −36 | $2.8 \times 10^{10}$ | $1.6 \times 10^{10}$ | −43 |
| Breaking extension, per cent | 2.2 | 2.3 | +5 | 3.9 | 4.3 | +10 |
| Work of deformation for 1 per cent extension, erg/cm² | $2.8 \times 10^{5}$ | $2.1 \times 10^{5}$ | −25 | $1.5 \times 10^{5}$ | $0.9 \times 10^{5}$ | −40 |
| Work of deformation to rupture, erg/cm² | $9.2 \times 10^{5}$ | $8.5 \times 10^{5}$ | −8 | $10.4 \times 10^{5}$ | $9.7 \times 10^{5}$ | −7 |
| Breaking load, kg/cm | 6.2 | 5.9 | −5 | 3.5 | 3.3 | −6 |

paper, which we consider to be insufficient to produce the required solubilisation of the coating at the high speeds and short times available in production 'wet-on-wet' printing.

One final point of interest concerns the use and measurement of the viscosity velocity product (VVP) as a measure of the picking resistance of a paper. Fig. 8 shows a picking test being carried out on the IGT printability tester; peeling beyond the nip is again observed and this will result in the actual separation velocity being different from the pendulum velocity indicated for that point. This might possibly explain the variety of opinions and results for the value of $k$ in $V\eta^k = \text{constant}$.[13] An exponential might also be required in the velocity term.

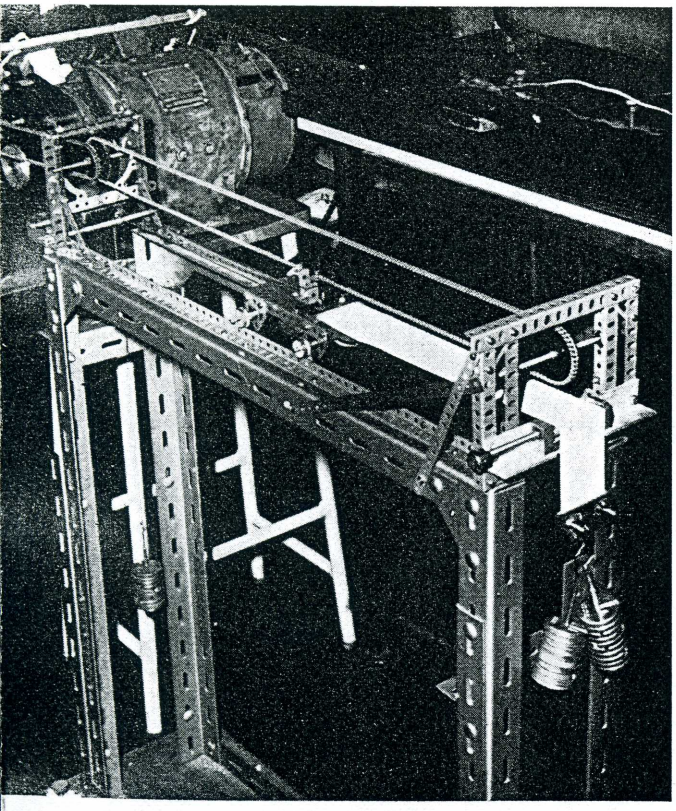

Fig. 9—General view of mechanical bending apparatus

We constructed a mechanical bending device to investigate some of the effects of bending on the mechanical and physical properties of paper. A view of this apparatus is shown in Fig. 9.

Paper strips 2 in wide were bent through 90° over a glass bending roller of radius 0.6 mm once in a forward and once in a reverse direction at a speed of 20 cm/sec under a tension of 200 g/cm. The radius of the bending roller was chosen to be close to the radius of bending of the paper occurring during printing. The angle of bend (90°) was greater than the maximum observed during printing (40°), but the tension (200 g/cm) was much less than the maximum value calculated during printing (3 kg/cm) as also was the speed (20 cm/sec compared with 100 cm/sec). Only a brief summary of the tests performed on this apparatus and the results obtained is possible in this paper.

*Effect of bending on load/elongation properties of paper (Instron)*

Table 2 shows some of the changes brought about by machine-direction and cross-direction bending.

TABLE 3—VARIATION OF VISCOSITY VELOCITY PRODUCT DUE TO BENDING

| *Coated art paper substance* | *Viscosity velocity product, cm poise sec⁻¹ × 10³* | | | | | |
|---|---|---|---|---|---|---|
| | *Cross-direction* | | | *Machine-direction* | | |
| | *Unbent* | *Bent (inside)* | *Bent (outside)* | *Unbent* | *Bent (inside)* | *Bent (outside)* |
| 170 g/m² | 18 | 12 | 9 | 25 | 13 | 10 |
| 136 g/m² | 11 | 7 | 8 | 17 | 12 | 7 |
| 102 g/m² | 18 | 11 | 9 | 28 | 18 | 13 |