a blanket and a suitable number of paper or carton sheets which may be varied in hardness to best suit the material being printed.

Apart from this means of suiting printing stock by varying the hardness of the packing, consisting of several sheets of materials offers the possibility of exchanging only underlay sheets when printing long runs or where slight damage has occurred, so that prolonged machine stoppages can be avoided.

Materials to underlay plates and blankets are available in a wide range of different thicknesses and in ready cut formats. Where possible, underlay sheets should be cut in the narrow web direction to ensure smooth clinging to the cylinder curvature. As underlay sheets are frequently very smooth and may tend to shift, it is recommended to rub the sheets with finely powdered colophonium on both sides.

The impressional setting, suiting the hardness of the packing demands more impressional force for a soft packing than for a hard packing. A setting of .002" (.05 mm.) may suffice for the latter, but a soft packing may require settings of .006" to .010" (.15 to .25 mm.) impression. Increased impressional setting, however, unavoidably causes a broadening of the line of contact in the printing, so that dot deformation and a shift in tonal and colour values may arise. This setting further causes unnecessary stretching of the paper and register will be affected. Too heavy a pressure setting between plate and blanket means that already at this stage image sharpness on plate and blanket will not correspond and may cause premature plate wear. Imprecise cylinder ratio may further make it difficult to maintain accurate print length, so that the image length on the printed sheet will not correspond with image length on the plate. On the machine too heavy a setting even with correct packing thicknesses will lead to an earlier wearing out of bearing.

To ensure perfect ink transfer from one cylinder to the next, a certain impressional force is needed, which in the line of printing is measured as linear pressure per centimetre and is controlled by impressional setting according to the cylinder scales.

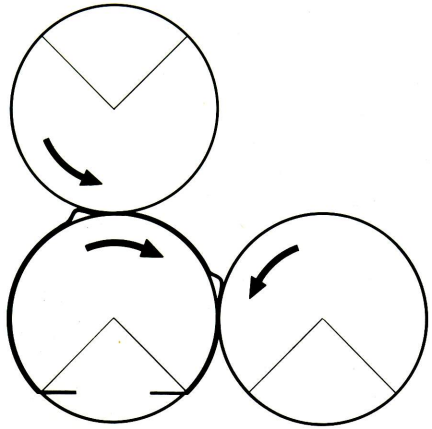
Controlled experiments measuring this pressure using medium hard packings on cylinder of $11^{13}/_{16}$" (300 mm.) diameter, provided the following average values for the required force:

plate - blanket
= 7.5-12.5 kg./inch. (3—5 kg./cm.)
line pressure

blanket - impression cylinder
= 11.25 kg./inch. (4.5 kg./cm.)
cast-coated paper
18.75 kg./inch. (7.5 kg./cm.)
coated art paper
25 kg./inch. (10 kg./cm.) chromo paper
30 kg./inch. (12 kg./cm.)
machine-finished paper

The impression contact line related to these figures, depending on pressure force, is between $^3/_{16}$" and $^3/_8$" (5 and 10 mm.). The smaller the cylinder diameter; the harder the packing will be, the more advantageous is the relation contact line pressure to contact zone and overall load.

The theoretically best cylinder ratio would be in zero setting for all cylinders using identical packing thicknesses to pitch diameter thickness. This would result in a perfect rolling of cylinders against each other, but



Cylinder drive is by toothed wheels and the aim is to obtain as little friction as possible on the cylinder surfaces. Originally it was assumed that ideal cylinder circumference ratios demand equal size cylinders. If cylinders were completely rigid bodies this would be correct, but as the blanket has a deformable surface — the elastic blanket — conditions are different. In the contact zones of the cylinders the blanket is pressed in longitudinal direction. In equal size cylinders the blanket then would become too long and bulges would form. To counteract this, the blanket cylinder must be held smaller, preferably to the extent of blanket elongation.
For this reason we recommend to keep blanket packings always at diameter (that is bearer ring height).

would not provide for impression. The impressional force required for this causes the incompressible but elastic blanket to become impressed under pressure, and it is here that the importance of precise cylinder setting becomes obvious. The forcing in of the blanket under pressure is dependant on the makeup of the packing, the quality and Shore hardness of the blanket and the characteristics of the stock being printed. As rubber cannot be compressed but simply "gives", there will be a certain bulge formation immediately in front and behind the print contact zone. In this actual zone the blanket travelling between the cylinders because of the heavy pressure exerted, reaches a higher surface velocity than the cylinders, and this leads to a sort of friction in relation to plate and paper, involving several disadvantages. To avoid these influences, it became necessary to bring cylinders to indentical surface velocity in the printing contact zone where load is heaviest.

These printing and machine design considerations lead the designers to construct blanket cylinders of smaller diameter, than these of plate and impression cylinders. In practice this means that the blanket should not extend over bearer ring height, while plate and printing stock should be over bearer ring height in related ratio.

Taking into account the above mentioned need for accuracy of print length, the following values can serve as an example of advantageous settings when printing a paper of medium substance and using a medium-hard packings:

thickness of packing paper = .004" (.1 mm.)
plate = .008" (.20 mm.) over bearer
blanket = ± 0 (bearer ring level)