ence of the tube or lining during a complete revolution.

Diameter	1st layer continuous		All Pebbles Continuous		
	R.P.M. Calculated	R.P.M. Observed	R.P.M. Calculated	R.P.M. Observed	Load
in.					in.
53	36.4	36.0	40.8	46.0	
54	36.1	——	40.5	——	+ 5
55	35.7	——	40.1	——	——
56	35.4	34.7	39.8	46.2	——
57	35.1	35.5	39.5	47.8	+ 2
58	34.8	35.0	39.1	48.5	+ 4
59	34.5	34.5	38.8	47.2	+ 10
60	34.2	(39.0)	38.5	47.2	+ 12
61	33.9	——	38.1	——	— 7
62	33.6	(38.0)	37.8	49.0	——
63	33.4	——	37.5	——	0
64	33.1	33.2	37.2	46.0	——
65	32.8	——	36.9	——	+ 6
66	32.6	33.5	36.7	51.2	——
67	32.3	——	36.4	——	+ 12
68	32.1	33.7	36.1	51.2	——
69	31.9	——	35.9	——	+ 17
70	31.6	——	35.6	——	——
71	31.4	——	35.3	——	——
72	41.2	——	35.1	——	——
					——

It will be observed that slightly more than the theoretical speeds are required to make the first layer continuous, and that though an increase of 3.9 to 4.4 R.P.M. is theoretically sufficient to take up all the pebbles to the circumference, in practice an increase of 10 or 12 R.P.M. is required (owing to excessive slip in inner layers); the greater speed is naturally required with very heavy loading as the inner circle formed by the last pebbles taken up is proportionately smaller. To take up two or more layers on the circumference, the R.P.M. would require an extra revolution per minute for each layer, more or less, in accordance with size of pebbles and diameter of layer formed. It is evident, therefore, that if the speed were set for two layers of pebbles to form an automatic lining, a variation in speed of 3 per cent. either way would result in increasing the layers to three or reducing to one. There is consequently no great difficulty in this direction, but the fact that an increase in speed is in these cases accompanied by a decrease in power consumption requires the provision of a constant speed prime mover.

In all cases where a continuous layer of pebbles is maintained on the liner, it was found that the smaller pebbles reached the circumference; experiments with a very small model tube mill with sand present showed that if the speed were gradually increased only sand was found on the circumference, but a rapid increase of speed up to the required point enabled the much larger beads used to form the automatic layer. It may be anticipated that in practice as the layers on the circumference become reduced in size by wear, the tendency will be for their place to be taken by sand, and especially by pyrite or amalgam, because the smaller particle can be held there by the centrifugal force where a larger particle would fall, as its centre would fall outside the limiting circle fixed by the speed of revolution.

Discharge.—While the inlet opening to the tube need only be large enough to pass the largest pebbles to be fed in, with an allowance for the wearing lining, the diameter of discharge aperture may either be large enough to bring down the level of the semi-fluid pulp to the required point, or the discharge screen may be provided with a lifting scoop delivering to a discharge outlet of smaller diameter.

This discharge scoop works in a chamber cut off from the end of the tube by a false end plate, provided with a screen having the diameter required; and iron balls or a few stem ends might be placed therein to smash up the small pebbles passing this screen, after the manner of the ingenious arrangement by Mr. Thurlow at the New Modderfontein.

Feed.—The Schmitt Feeder is very satisfactory and flexible, and where this is used there is no reason why the inlet to tube should not be of sufficient diameter as to obviate the possibility of jamming of the pebbles fed and to allow larger rock to be used for this purpose where desired.

Prime Mover.—The peculiarity of the tube mill that an increase of speed may have the effect of reducing the power consumed renders it necessary that the prime mover should be of a constant speed type to avoid the possibility of a dangerous runaway. This should be more especially necessary if the automatic lining of pebbles were used, as in this case the normal speed is much nearer the danger limit.

Measuring Apparatus.—The present usual method of controlling the pebble feed to tube mills by means of an ordinary ammeter in a three-phase circuit has several disadvantages. In the first place it does not discriminate between loads above and below the maximum power consumption, and of course the reading is directly influenced by the variations in the voltage of the power supply which at times are very considerable. Where measurement of power consumed must be relied upon, the most advantageous instrument would be a graphic recording watt-meter and a daily chart from this would be a useful check upon the regularity of maintenance of the required pebble load. If the same level of load is maintained in a silex liner it is obvious that the power consumed will vary with the wear of the liner, but experience will enable this variation to be properly allowed for and the chart may be marked as a guide.

It will be obvious that in comparative trials with various adjustments an integrating watt-meter, duly calibrated, is the only reliable instrument where motors are used and figures based upon comparative ampere readings are quite useless.

It is to be regretted that no reliable method of directly measuring the pebble load, while the tube is running has yet been devised, though some operators consider that the load may be roughly judged by pushing a thin iron rod through the centre hole of the discharge screen and thus judging the depth of the fallen pebbles.

In ordinary tube mill installations driven by three-phase motors, one integrating watt-meter would be sufficient for all the tube motors to enable power charges to be properly allocated, one ammeter and one voltmeter would likewise be sufficient for the whole circuit, while each motor switchboard should be provided with a recording watt-meter, and an ordinary indicating watt-meter should be placed in a secure position, clearly visible from the pebble feeding point.

The effects of varying speeds of revolution.—In all the experiments carried out under this head, the power consumed when the tube was running empty at the various speeds was first determined. The net power after deducting these results from the final reading refers therefore to the power actually consumed in lifting pebbles, plus internal friction inside the tube. It may be assumed that the power actually consumed in lifting pebbles will be a fair measure of the crushing capacity of the tube, and that at anything like reasonable speeds and loads the amount of fine material produced per H.P. will not vary to any great