From this equation the transmission line drop can easily be obtained.

Equation (1) gives true generator voltage Eg when we know the receiver voltage E, the resistance and reactance drops r and x and the angle of lag O. The only approximation so far is the neglect of leakage and capacity effects, which for all ordinary purposes may be safely neglected. In



order to apply the tables given later in this paper it becomes necessary to make one further approximation. The following tables assume that the voltage drop Eg-E is equal to the projection of z (the resultant of r plus x) on E (see fig. 6).

If the angle subtended by z is zero this assumption becomes absolutely correct. This condition is shown at A, fig. the drop becomes a maximum and the error in using the fol- find a multiplying factor.

reactive volts

lowing tables becomes zero. It is also evident (figs. 6 and 7) that the larger the angle subtended by z, the greater will be the error of assuming that the drop Eg-E is equal to the projection of z on E. This error will reach a maximum (shown at B, fig. 7) at a point just 90 degrees from the point of zero error.

The maximum error on account of the assumption that the drop Eg-E is equal to the projection of z on E is given in the following table :-

IOOZ	Maximum							
E	error							
or per cent. of impedance volts	in per cent. of z							
5.	2.5.							
IO.	5.							
15	7.5.							
20.	IO.							
25.	12.5.							
30.	15.							
40.	20							

In other words, the drop as obtained by the following tables should be increased as a maximum by the percentages given in the foregoing table. It should be noted that the maximum error occurs only with a leading load power factor, a condition seldom met with in practice.

To obtain exact drops the formula (1) may be used.

To obtain approximate drops proceed as follows :---

1.-Calculate the ohmic drop-that is, proceed just as if direct current were being dealt with.

2.-From either Table I. (25 cycles) or Table II. (60 cycles) find the ratio of reactive to ohmic drop.

3.-Follow down the first column of Table III. to the 7. When the power factor of the line and load are the same ratio thus found and on horizontal line under proper factor

TABLE I.

Ratio------in a 3-phase line, triangular spacing, 25 cycles.

		ohmic vol	ts										1.			
Size of	Diameter	Resistance														
wire	in inches.	per mile of														
B. & S.		single	-		1. The	-Dista	nnce	betwe	en w	ire c	entres	in	inche	s	132	
		conductor	2	6	12	18 '	24	30	36	42	48	60	72	96	120	144
10	.102	5.27	.04	.05	.05	.06	.06	.06	.06	.07	.07	.07	.07	.07	.08	.08
9	.114	4.18	.05	106	.07	.07	.08	.08	.08	.08	.08	.09	.09	.09	.10	.10
8	.128	3.31	.06	.07	.08	.09	.09	.10	.10	.10	.10	.11	.11	.11	.12	.12
7	, .144	2.63	.07	.09	.10	.11	.12	.12	.12	.13	.13	.13	.14	.14	.15	.15
6	.162	2.08	.08	.11	.13	.14	.14	.15	.15	.16	.16	.17	.17	.18	.18	.19
5	.182	1.65	.10	.13	.16	.17	.18	.18	.19	.20	.20	.21	.21	.22	.23	.23
4	.204	1.31	.12	.17	.19	.21	.22	.23	.24	.24	.25	.25	.26	.27	.28	.29
* 4	.232	1.31	.12	.16	.19	.20	.21	.22	.23	.24	.24	.25	.26	.27	.27	.28
3	.260	1.039	.14	.20	.23	.25	.27	.28	.29	.29	.30	.31	.32	.33	.34	.35
2	.292	.824	.18	.24	.29	.31	.33	.34	.35	.36	.37	.38	.39	.41	.43	.44
I	.328	.653	.21	.30	.36	.38	.40	.42	.44	.45	.46	.48	.49	.51	.53	.54
0	·373	.518	.25	.36	.43	.47	.50	.52	.54	.55	.57	.59	.61	.64	.65	.67
00	.418	.411	.31	.44	.53	.58	.61	.64	.66	.68	.70	.72	.75	.78	.81	.83
000	.470	.326	.37	.54	.65	.71	.76	.79	.82	.84	.86	.90	.92	.97	I.0I	1.03
0,000	.528	.258	.45	.66	.80	.88	.93	.98	1.01	1.04	1.07	1.11	1.15	1.20	1.25	1.28
250,000	. 590	.219	.50	.75	.91	1.00	1.07	1.12	1.16	I.20	1.23	1.28	1.32	1.30	I.44	1.48
300,000	.630	.182	.58	.89	1.08	1.19	1.27	1.33	1.38	1.43	1.47	1.53	1.58	1.65	1.72	1.77
400,000	.728	.137	.72	1.12	1.38	1.53	1.63	1.72	1.78	1.84	1.80	1.07	2.04	2.15	2.23	2.30
500,000	.815	.109	.85	1.36	1.68	1.87	2.01	2.11	2.10	2.26	2.32	2.43	2.51	2.64	2.74	2.83
600,000	.893	.001	.97	1.45	1.97	2.19	2.36	2.48	2.58	2.67	2.74	2.86	2.06	3.12	3.25	3.34
800,000	1.031	· .0683	1.18	2.00	2.51	2.81	3.02	3.18	3.32	3.43	3.53	3.70	3.83	4.04	4.21	4.34
I,000,000	1.152	.0547	1.38	2.40	3.02	3.42	3.68	3.80	4.05	4.20	4.32	4.53	4.70	4.06	5.16	5.30
1,500,000	1.412	.0364	1.79	3.32	4.28	4.82	5.24	5.55	5.78	6.03	6.21	6.51	6.77	7.18	7.48	7.73
2,000,000	1.613	.0273	2.14	4.17	5.46	6.21	6.75	7.15	7.40	7.78	8.07	8.44	8.78	0.31	0.72	10.06
*This and al	l larger size	s stranded cor	ducto	r									1000		5.15	