obtained by integration of eqn. (17). The agreement is somewhat better than one might expect from the ratio $2b \times 10^{-12}/a\beta_0^2$ found in the comparison with Bridgman's data. The theoretical temperature coefficient from eqn. (18) is compared in table 3C with results discussed by Mott and Jones.[14] Again order-of-magnitude agreement is obtained. While only in approximate agreement all of these results should be considered in the light of the simplicity and approximate nature of the theory.

TABLE 3.—COMPARISONS OF THEORETICAL AND OBSERVED COMPRESSIBILITIES

A. WITH BRIDGMAN [17]

solid	ϕ_0	$a' \times 10^{-7}/\beta_0$	$2b \times 10^{-12}/a\beta_0^2$
copper	3·5	0·92	3·7
silver	4·4	1·07	4·9
lithium	1·14	1·008	1·5
sodium	1·51	1·08	1·5
beryllium	2·15	0·85	3·2
magnesium	2·13	0·96	2·0
calcium	2·2	0·98	1·4
strontium	—	(1·0)	1·0
barium	—	(1·0)	1·14
aluminium	2·10	0·96	2·5
silicon	4·75	0·84	—
iron	—	(1·0)	5·6
platinum	—	(1·0)	12·6
diamond	2·92	1·0	—

B. WITH WALSH AND CHRISTIAN [18]

	V/V_0						
	$p = 10^5$ atm	$p = 2 \times 10^5$ atm		$p = 3 \times 10^5$ atm		$p = 4 \times 10^5$	
	(calc.)	(calc.)	(obs.)	(calc.)	(obs.)	(calc.)	(obs.)
aluminium	0·888	0·807	0·843	0·748	0·796	*	0·759
copper	0·930	0·875	0·893	0·831	0·866	0·791	0·838

* theoretical series nonconvergent at $p \geqslant 3{\cdot}3 \times 10^5$ atm.

C. $10^3 d \log \beta / dT$

	(calc.) (1)	(calc.) (2)	(obs.) [14]
lithium	0·40	0·77	0·71
sodium	0·62	1·03	1·20
calcium	0·41	0·33	0·60
aluminium	0·31	0·38	0·55
lead	0·42	0·44	0·56

(1) from $\alpha = 3C/2(\phi + \epsilon_c)$; (2) from observed α.

Finally, detonation velocities of several explosives with inert additives were computed by the method outlined above using this theory of compressibility. The results are summarized in table 4, together with the data taken from the smoothed experimental data. In general, the calculated and observed data are seen to be in good agreement over the entire range of compositions. This, however, is a much less critical evaluation of the theory of compressibility than, for example, the comparisons with the data of Walsh and Christian because either α_I/α was relatively low (large N_w), or the pressure was so low (small N_w) that $\alpha_I \sim \alpha I_0$.

The important application of the thermohydrodynamic theory to this problem concerns the $\alpha(v)$ curve. In fig. 3 are plotted the calculated $\alpha(v)$ data for these explosives. Included also are the $\alpha(v)$ data computed by the " inverse method " for 50-50 TNT + SN and 90-10 RDX + water. The results seem to support the approximate generality of the empirical $\alpha(v)$ curve and the equation of state (1).

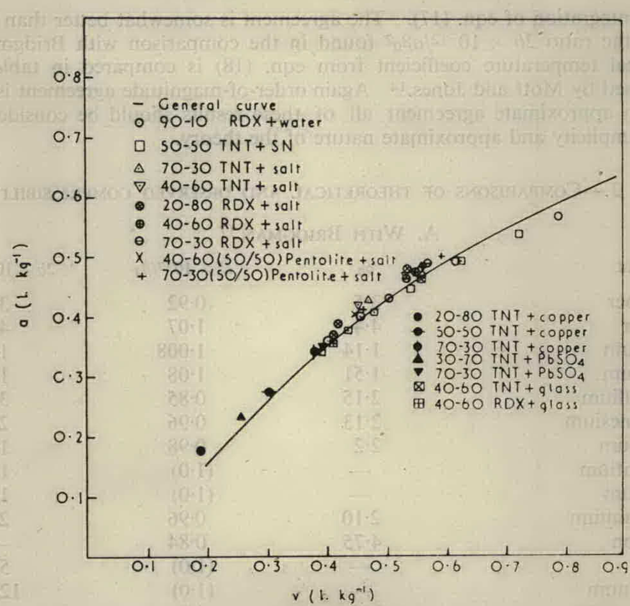

FIG. 3.—Covolume relations in explosives with inert additives.

TABLE 4.—COMPUTED VELOCITIES FOR EXPLOSIVE + INERT MIXTURES

A. $D = D_{1\cdot0} + S(\rho_1 - 1\cdot0)$

explosive	$D_{1\cdot0}$ (m sec^{-1}) (calc.)	$D_{1\cdot0}$ (m sec^{-1}) (obs.) (interpolated)	S (m sec^{-1} g^{-1} cm^3) (calc.)	S (m sec^{-1} g^{-1} cm^3) (obs.)* (interpolated)
100/0 TNT + salt*	(5010)	5010	(3225)	3225
90/10 TNT + salt	4710	4660	3265	3340
80/20 TNT + salt	4405	4305	3330	3410
70/30 TNT + salt	4050	3950	3435	3220
60/40 TNT + salt	3610	3600	3610	3560
50/60 TNT + salt	3070	3245	3840	3650
40/60 TNT + salt	2415	2980	4145	3740
100/0 50/50 pentolite + salt	(5480)	5480	(3100)	3100
80/20 50/50 pentolite + salt	4900		3120	
70/30 50/50 pentolite + salt	4600	4590	3190	3200
54/46 50/50 pentolite + salt	3885	6780 (1·85)	3420	
40/60 50/50 pentolite + salt	3070	3000	3735	3500
100/0 RDX + salt	(5900)	5900	(3570)	3570
70/30 RDX + salt	4935		3095	
40/20 RDX + salt	3300		3535	
20/80 RDX + salt	1730		4180	

RDX + salt	ρ_1	D (calc.)	D (obs.)	TNT + glass	ρ_1	D (calc.)	D (obs.)
70/30	1·33	5930	5825	80/20	1·0	4260	4200
40/60	1·51	5150	5100	40/60	1·34	3190	3350

RDX + glass*	ρ_1	D (calc.)	D (obs.)
80/20	1·34	6165	6150
60/40	1·48	5520	5590
40/60	1·76	4990	5100

TNT + copper D (calc.) $= 6900 - 2760x$
$(\rho_1 = 1\cdot59 + 1\cdot3x + x^2 + 2x^3)$

TNT + $PbSO_4$ D (calc.) $= 6900 - 2480x$
$(\rho_1 = 1\cdot59 + x + 1\cdot6x^2)$

* β_0 data used: copper: $7\cdot8 \times 10^{-7}$; salt: $4\cdot18 \times 10^{-6}$; $PbSO_4$: $1\cdot94 \times 10^{-6}$: glass: $(\alpha_I = \alpha_{I_0})$.

+ agreed within $\pm$ 200 m/sec from $N_w = 1\cdot0$ to 0·27 (data in classified literature).