tion. If this were the case, then lowering the surface tension of the atomizer solution should cause the particle size to decrease; this effect has also been observed in the present work in experiments in which the chromic acid was made up in acetone and water mixtures.

The fate of a droplet bathed in flame gases may be visualized as one of rapid contraction of a spherical shape, the centre at least of which may retain a trace of solvent until contraction can no longer take place. At this stage, the temperature of the surface rises particularly rapidly by both physical and heterogeneous chemical processes, causing the particle to solidify, melt or vaporize (depending on temperature). Decrepitation might then result if the last traces of solvent were to cause particles which are molten on the surface to explode. Fig. 2 shows strikingly such a particle at the instant of disintegration.

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Comments on Effect of Vibrations on the Transition Regime in Pipe Flow

THE results recently reported by James and Morton[1] disagree with results which I obtained in 1951 in research supported by the US Office of Naval Research. My work actually covered the effects of transverse and longitudinal vibrations on flow in circular tubes over a range of Reynolds numbers from 750 to a little more than 10,000, including the transition regime. I concluded that vibration had no effect on the friction factor except that at Reynolds numbers above about 2,200 flow which was laminar without vibration became turbulent with certain types of vibration. (Laminar flow was obtained to a Reynolds number of about 15,000 in the apparatus using a special head tank and water as fluid.)

My tests in the transition regime delineated by James and Morton were made in an aluminium alloy tube (12 ft. long, 0·5 in. outside diameter, 0·065 in. wall thickness), using chiefly aircraft hydraulic oil as fluid. The tube was clamped near both ends to give fixed end conditions about 9 ft. 2 in. apart. Piezometer taps were located 11·5 ft. apart, outside the clamps. The taps were carefully deburred by reaching in from the ends of the tube. An entrance length of about 30 in. was joined smoothly to the upstream end. A heat exchanger was provided to maintain constant temperature.

Table 2. VIBRATION PROGRAMMES (VIBRATORS APPLIED AT CENTRE BETWEEN CLAMPS)

A Magnetic vibrator				*B* Hydraulic vibrator			
Freq. (c/s)	Amp. (in.)	Loops	Resonance	Freq. (c/s)	Amp. (in.)	Loops	Resonance
0	0	0	—	0	0	0	—
23·3	0·188	1	Yes	8·3	0·031	1	No
35·0	0·032	1	No	16·7	0·031	1	No
46·7	0·125	3	Yes	25·0	0·050	1	No
70·0	0·020	3	No	31·7	0·250	1	Yes
93·3	0·093	3	Yes	40·0	0·031	1	No
160·0	0·015	5	No	50·0	0·031	3	No
187·0	0·063	5	Yes	58·3	0·031	3	No
250·0	0·010	?	No	0	0	0	—
333·0	0·010	?	No				
0	0	0	—				

Amplitudes are half the peak to peak displacement.

The experiments consisted essentially of establishing a given flow condition without vibration and measuring the discharge, pressure drop and temperature for that condition. Then, a programme of transverse vibration was followed noting the changes, if any, in the quantities. No changes were observed for any flow condition (except in a series of tests with water at Reynolds numbers above 2,200, as already noted). A typical set of data for aircraft hydraulic oil (*AN-O*-366) is quoted in Table 1 and vibration conditions are described in Table 2.

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CHEMISTRY

Variations in Ozone Formation across the Ozonizer Discharge Gap

I HAVE studied, by means of the planar ozonizers with quartz windows, described previously[1], the variations in the formation rate of ozone in the discharge gap. Double-glass and metal–glass ozonizers with 3 mm gaps were used with dried air and oxygen at a pressure of 760 mm of mercury and in the temperature range 20°–25° C.

A beam of radiation of wavelength 2537 Å, which is heavily absorbed by ozone, traverses the discharge gap with its axis parallel to the ozonizer electrodes, and a movable slit, 0·16 mm wide, selects the radiation which has passed through a known region of the gap. This radiation reaches a quartz-window photomultiplier with a dielectric filter transmitting at 2537 Å and the output voltage of the photomultiplier controls one beam of a cathode ray oscillograph to indicate ozone concentration in the chosen region. A single-shot time base is used which is triggered either by the discharge or a few milliseconds before discharge. The other beam indicates the ozonizer current; typical oscillograms are shown in Fig. 1. The first three half-cycles of a discharge are usually unsteady, and in deducing formation rates later half-cycles, usually from the sixth to the twelfth, were used. To find the formation rate in a half-cycle from the oscillogram, a correction for diffusion is made by using the slope in the quiescent part of the half-cycle. A correction is also

Table 1. TYPICAL MEASUREMENTS IN TRANSITION REGIME USING AIRCRAFT HYDRAULIC OIL (*AN-O*-366)

Reynolds number	Vibration programme	Δp (lb./in.^{2} ft.$^{-1}$ measured)	Δp calculated for laminar flow	λ	Effect of vibration	Temp. (°F)	Mean pressure (lb./in.^{2} above atmos.)	Kinematic viscosity* (ft.^{2}/sec × 10^4)	Unit weight (lb./ft.^{3})
1460	*A*	0·826	0·858	0·042	None	74	78	2·17	53·0
1530	*B*	0·958	1·030	0·0406	None	70	91	2·38	53·1
1960	*B*	1·390	1·400	0·0323	None	70	134	2·40	53·1
2120	*B*	1·480	1·510	0·0294	None	70	150	2·40	53·1
1950	*A*	1·390	1·395	0·0326	None	70	135	2·40	53·1
2110	*A*	1·480	1·510	0·0297	None	70	148	2·40	53·1

* Determined by Engler viscosimeter at atmospheric pressure and corrected to mean pressure by adding 1·5 per cent for each 100 lb./in.^{2} above atmospheric pressure.