No. (4) remark that as long as there is any motion of the heterogeneous liquid within the imperfectly elastic vessel the liquid must be losing energy; and the energy cannot become infinitely small with any finite spherical portion of the liquid homogeneous.

(1) The initial motion of a heterogeneous liquid is irrotational only at the first instant after being *quite suddenly* started from rest by motion of its boundary. Whatever motion be subsequently given to the boundary the motion of the liquid is never again irrotational. Hence

(2) If the boundary be suddenly brought to rest at any time, the liquid, unless homogeneous throughout, is not thereby brought to rest; and it would go on for ever with undiminished energy if the liquid were perfectly inviscid and the boundary absolutely fixed. The ultimate condition of the liquid, if there is no *positive* surface tension in the interfaces between heterogeneous portions, is an infinitely fine mixture of the heterogeneous parts.[1] And, if there were no gravity or other bodily force acting on the liquid, the density would ultimately become uniform throughout. Take, for example, a corked bottle half full of water or other liquid with air above it given at rest. Move the bottle and bring it to rest again: the liquid will remain shaking for some time. An ordinary non-scientific person will scarcely thank us for this result of our mathematical theory. But, when we tell him that if air and the liquid were both perfectly fluid (that is to say perfectly free from viscosity), the well-known shaking of the liquid surface would, after a little time, give rise to spherules tossed up from the main body of the liquid; and that the shaking of the liquid, left to itself in the bottle supposed perfectly rigid, will end in spindrift of spherules which would be infinitely fine if the capillary tension of the interface between liquid and air were infinitely small, he may be incredulous unless he tends to have faith in all assertions made in the name of science.

(3) If the boundary is an enclosing vessel of any real material (and therefore neither perfectly rigid nor perfectly elastic), and if it is laid on a table and left to itself, under the influence of gravity, the liquid, supposed perfectly inviscid, will lose energy continually by generation of heat in the containing vessel, and will come asymptotically to rest in the configuration of stable equilibrium with surfaces of equal density horizontal and increasing density downwards.

(4) With other conditions as in (3), but no gravity, the ultimate configuration of rest will be infinitely fine mixture (probably, I think of equal density throughout). Consider, for example, two homogeneous liquids of different densities filling the closed vessel, or a single homogeneous liquid not filling it. As an illustration, take a bottle half full of water, and shake it violently. Observe how you get the whole bottle full of a mixture of fine bubbles of air, nearly homogeneous throughout. Think what the result would be if there were no gravity, and if the water and air were inviscid and the bottle shaken as gently as you please; and if there were perfect vacuum in place of the air; or, if for air were substituted any liquid of density different from that of water.

[1] "Popular Lectures and Addresses," by Lord Kelvin, vol. i. pp. 19, 20, and 53, 54. See also *Philosophical Magazine*, 1887, second half-year: "On the formation of coreless vortices by the motion of a solid through an inviscid incompressible fluid"; "On the stability of steady and of periodic fluid motion"; "On maximum and minimum energy in vortex motion."

THE RETURN OF BROOKS'S COMET.

On July 6, 1889, Mr. W. R. Brooks, of Geneva, New York, U.S.A., discovered a somewhat faint, telescopic comet at R.A. 356°, Dec. 9° south, in the southern region of Pisces. It had a short spreading tail, and was moving slowly to the E.N.E.

Observations in a few days enabled the orbit to be computed, and the small inclination (6°) intimated that the comet was probably one of short period. This proved to be the case after further observation, and the time of revolution was determined as about seven years. Otto Knopf, from three positions obtained at Mount Hamilton on July 8, at Dresden July 30, and at Vienna on August 19, deduced the period as 7·286 years. The comet was followed until January 1890, and from the whole series of observations Prof. S. C. Chandler found a period of 7·073 years, and that the orbit at aphelion approaches very closely to the orbit of the planet Jupiter. From March to July 1886, the distance of the comet and planet appears to have been less than 10,000,000 miles. The theory was suggested by Prof. Chandler that the comet may be identical with Messier-Lexell's comet of 1770; but Dr. C. L. Poor, on reinvestigating the matter, found little evidence in support of the idea.

The possible connection of the comet with that of 1770 is by no means the only interesting feature of this object. On August 1, 1889, Prof. E. E. Barnard observed that the comet was broken up into several detached fragments. It had previously been seen single, and had been submitted to pretty general observation without anything remarkable having been detected; but on the night of August 1, it appeared to have been suddenly shattered by some extraordinary forces or vicissitudes of a very mysterious character. One of the smaller fragments, together with the largest mass, remained visible for several months, moving in concentric paths, and forming a very interesting and rare telescopic spectacle.

The comet was a fairly conspicuous object in telescopes, but it was not visible to the unaided eye. Its apparent motion was very slow, for early in November its position was only seven degrees north of the place it had occupied four months before.

Dr. Poor fixed the next perihelion passage for November 4, 1896, and an ephemeris was prepared by Bauschinger for the spring and summer of 1896, as it was expected the comet might be picked up some months before its arrival at perihelion. This expectation has been fully realised, for the comet was re-discovered on the night of June 20 by M. Javelle, using the 30-inch refractor of the observatory at Nice. Its place was almost identical with that given in the ephemeris, and the re-discovery of the comet may therefore be regarded as another triumph for mathematical astronomy.

This comet should prove an extremely interesting object in regard to its physical appearance and changes of aspect. At the present time it is in Aquarius a little west of *Delta* in that constellation, and its position during the next few weeks will be nearly stationary. The ephemeris by Bauschinger is as follows:—

1896.	R.A. h. m. s.	Decl. ° ′ ″	Log. Δ	Brightness.
July 15	22 39 1	−18 9 53	0·1124	1·14
19	39 58	12 28	0·0992	1·22
23	39 44	16 28	0·0866	1·31
27	39 24	21 49	0·0746	1·40
31	38 38	27 52	0·0633	1·50
Aug. 4	37 26	34 44	0·0529	1·59
8	35 50	41 51	0·0436	1·68
12	33 51	48 48	0·0353	1·76
16	22 31 34	−18 55 2	0·0284	1·84

Thus the comet is likely to be visible throughout the present summer and ensuing autumn, for its brightness is gradually increasing, and it will remain in a favourable position all the time. Its southern declination of more than 18° is, however, rather unfortunate, as its altitude is only about 20°, so that observers will require to watch it from a position commanding a good open view of the southern sky.

W. F. Denning.