ΑΝΑΚΟΙΝΩΣΕΙΣ ΜΕΛΩΝ

ΝΙΚΟΥ ΒΕΗ.—*Δημώδη ἑλληνικὰ κείμενα μετὰ σχολίων, ἐκ τῆς βιβλιοθήκης Μαρτίνου Κρουσίου**.

ΣΠ. ΔΟΝΤΑ καὶ Δ. ΗΣΑΪΑ.—*Νεώτεραι πειραματικαὶ παρατηρήσεις ἐπὶ τοῦ μηχανισμοῦ τῆς διαρρυθμίσεως τῆς θερμότητος τῶν ζώων**.

ΑΝΑΚΟΙΝΩΣΕΙΣ ΜΗ ΜΕΛΩΝ

ΕΦΗΡΜΟΣΜΕΝΗ ΦΥΣΙΚΗ.—**Measurement of the Duration of Ultra-short Transient-time Phenomena by means of a Spiral Sweep on a Cathode Ray Oscilloscope,** *by* ***P. SantoRini*****. Ἀνεκοινώθη ὑπὸ τοῦ κ. Κ. Μαλτέζου.

A method whereby a cathode ray oscilloscope is employed as an indicating instrument for the measurement of the duration of ultra-short transient-time phenomena, has been published by H. D. Brailsford[1], in 1940. By this method, during the fraction of time corresponding to the

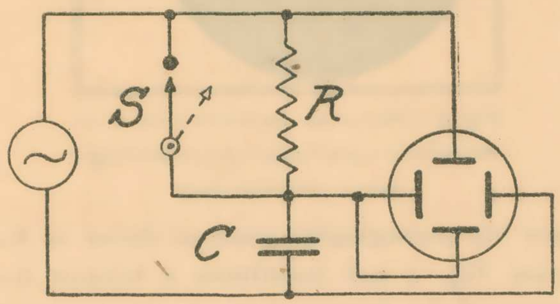

Fig. 1.—*H. D. Brailsford's basic layout.*

transient-time to be measured, H. D. Brailsford arranges the spot to run on a *circular* path, which he obtains by the already known phase-splitting R-C combination in Fig. 1. He leaves switch S normally closed, but it

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* Θὰ δημοσιευθῶσι προσεχῶς.

** Π. ΣΑΝΤΟΡΙΝΗ, Μέθοδος καὶ διάταξις διὰ τὴν σπειροειδῆ σάρωσιν τοῦ φωτεινοῦ στίγματος μιᾶς Λυχνίας Καθοδικῶν ἀκτίνων πρὸς μέτρησιν βραχυτάτων χρονικῶν διαστημάτων καὶ ὡς διάταξιν σπειροειδοῦς σαρώσεως ἐν τῇ τηλεοράσει.

1 «A Cathode-Ray Stopwatch». Vol. 4, Nos 4 and 5 (June-July 1940) of Allen B. Du Mont Laboratories' Publications.

opens mechanically and remains open as long as the transient-time phenomenon lasts. Thus, the width of the central angle of the arc traced by the spot on the screen of the tube, results in a direct measure for the duration of the transient-time phenomenon.

An examination of the photograms obtained by H. D. Brailsford leads, however, to the following objections:

1.— Since *prior to* and *after* the transient-time phenomenon, switch S remains closed, the path of the spot results in a horizontal recurrent sinusoidal sweep. Obviously, this extremely brilliant horizontal line

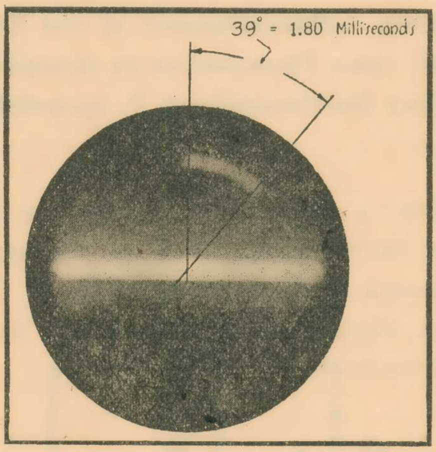

Fig. 2.—*Photogram reproduced from H. D. Brailsford's original paper. Bright horizontal trace is recurrent sweep.*

strongly impresses the photographic plate, as shown in H. D. Brailsford's original photogram Fig. 2 and constitutes a definite drawback of the method, on account of the danger of blurring the photographic record.

2.— Since the transient-time is being measured by the width of the central angle of the arc, it is obvious that only transient-times of less duration than the time corresponding to one period of the sine wave, can be dealt with. If the deflecting voltage be taken from the 50-cycle power supply, the angular velocity of the spot becomes 2π in 0,02 sec. Thus, no transient-time phenomenon of a duration of more than 0,02 sec can be measured by the original method.

In the method developed in the present paper both of the above drawbacks are avoided, as no recurrent trace appears on the screen and the timing path of the spot becomes a spiral curve, considerably longer than a circle (Fig. 3).

Thus, in the already mentioned example, the measurable maximum duration of a phenomenon becomes the number of separate complete turns of the spiral curve that may appear on the screen, times 0,02 sec.

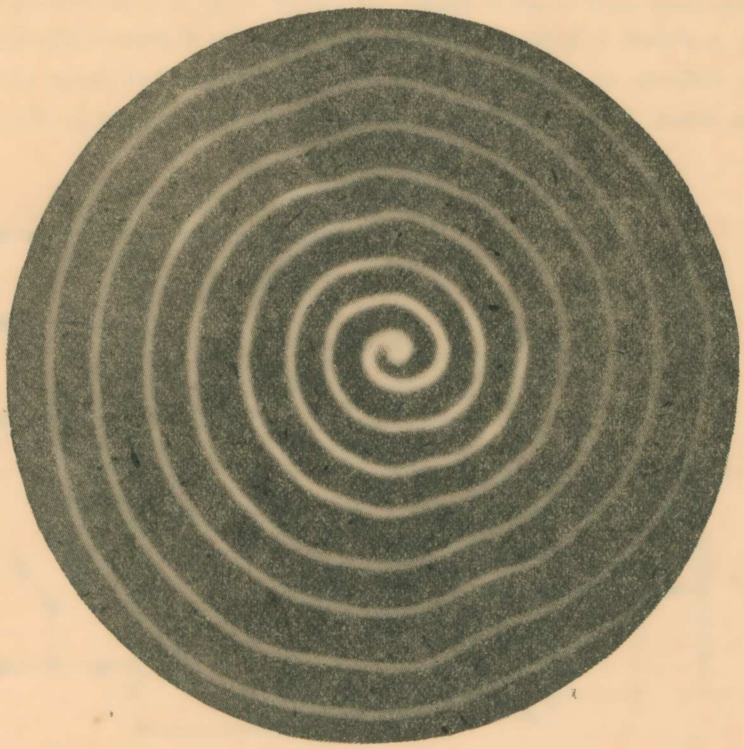

Fig. 3.—*Spiral, instead of Circular Trace of Spot, permits the measurement of transients of considerably longer duration. The deflecting frequency is ~ 1000 kc. p. sec. Irregularities in spiral shape are due to imperfect sinusoidal deflecting voltage. (Unretouched enlargement).*

As to this last point, the author makes use of salvaged German Radar C. R. tubes, with a spot diameter of less than 0,25 mm. Thus, for a spiral curve limited by the radii of 25 mm and 10 mm, or less, a useful area of at least 15 mm width may contain up to 50 fully distinguishable turns of the spiral. In the terms of the above example, this means that transient-time phenomena of about 50 times longer duration than with the original method, could be accurately measured.

By eliminating the blurred recurrent trace on the screen, prior to and after the phenomenon proper, the accelerating voltage of the second anode of the tube could be increased to a multiple of the permissible voltage for recurrent phenomena. As a matter of fact, the spot runs only once over the spiral path and can not damage the screen material. As a consequence, accelerating voltages close to the isolation breakdown limit of the tube (8kV) have been used when working with high frequency deflecting voltages.

Fig. 4 shows a typical voltage supply to the different electrodes of a common cathode ray tube. As everyone knows, the brilliancy of the spot increases when the contact determining the negative bias to the Wehnelt

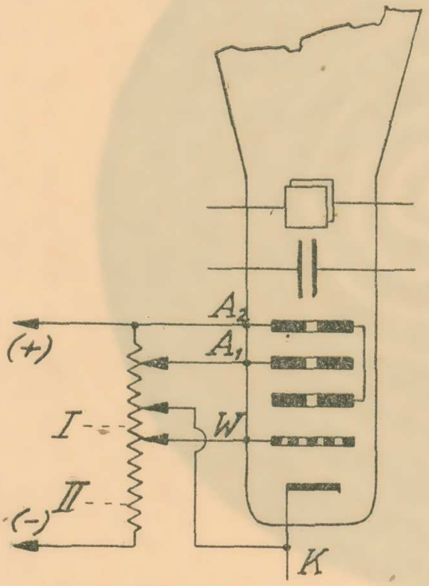

Fig. 4. — *Voltage supply to the electrodes of a Cathode Ray Tube.*

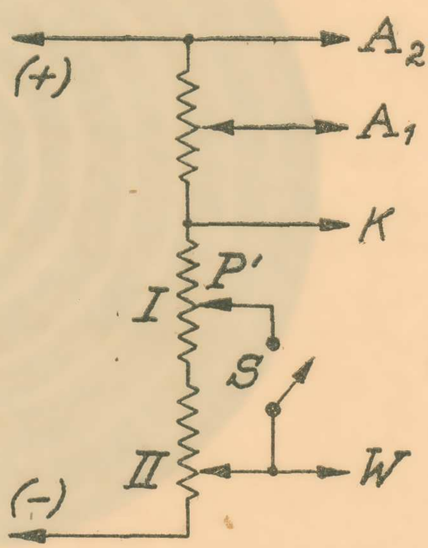

Fig. 5. — *Layout for Blanking Spot prior to and after Transient.*

grid, is moved towards position I, whereas the brilliancy decreases when the contact is moved in the opposite direction, until, in position II, the spot disappears completely.

On the basis of the above property, Fig. 5 shows an arrangement with a well insulated switch S and part of the network substituted by a potentiometer P′. Normally, switch S remains open and the contact to grid W is adjusted so as to fully extinguish any trace of the spot on the screen. When switch S is closed, in mechanical synchronism with the beginning of the transient, the section I - II of the potentiometer network is short-circuited, the remaining resistance towards the cathode K having been adjusted, by means of the sliding contact on P′, so as to correspond to the maximum brilliancy of the spot, which now traces a circular path on the screen. In synchronism with the end of the phenomenon, switch S is mechanically opened again, with the result that the bright circle on the screen disappears. Adjustments of both potentiometer sliders are not independent from each other, but this work has to be carried out only once and interferes in no way with any further normal use of the Oscilloscope.

In order to avoid the inertia lag due to the mechanical control of switch S, an adequate electronic device may be substituted in its place. Fig. 6 shows an example of such an arrangement, where a multi-electrode

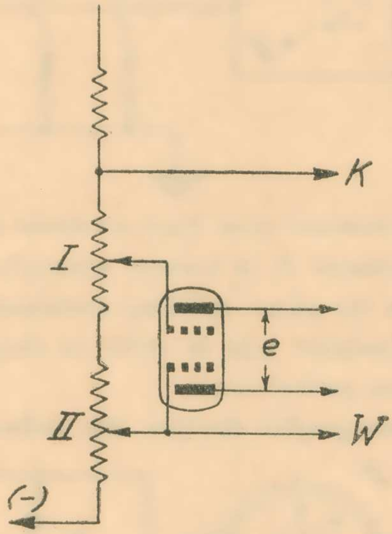

Fig. 6. — *Electronic version of Fig. 5. Multi-electrode glow discharge tube N used for Blanking Spot.*

glow discharge tube N fires and shortens section I - II of the network, as long as an adequate voltage e, derived from the transient-time phenomenon, is applied to both external electrodes of N [2], or an ordinary two-electrode glow discharge tube N can be ionized, without any shortening galvanic contact, by an external high frequency field, etc.

[2] Special care should be taken in this case in regard to the insulation of the circuits connected to e, because they come in contact with the live side of the potentiometer network of the C-R Power Supply. Otherwise the cathode side of the network should be grounded, contrarily to the customary use.

During the time the switch remains closed, the spot travels over a circular path. In order to transform this into a *spiral* trace, it is obviously only necessary to reduce continuously the deflecting voltage. In Figs. 7 and 7a, simple mechanical devices are shown, whereby the deflecting voltage,

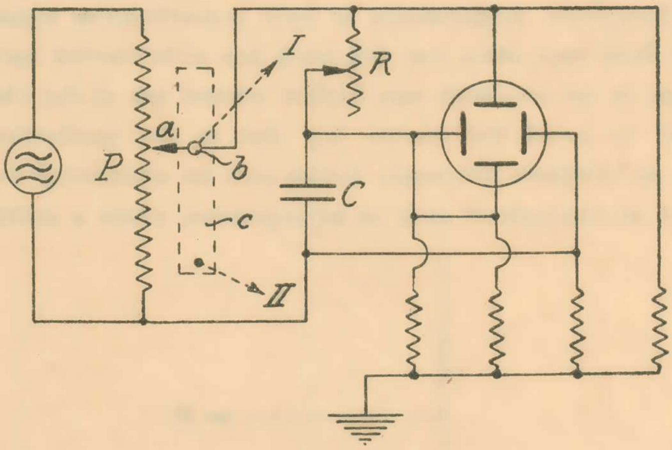

Fig. 7.—*Mechanical Spiral Tracer and Blanker (see text).*

taken off the potentiometer P, is lowered manually or, in Fig. 7, by the tension of a spring. In the phase-splitting combination R-C, the resistor should be of the adjustable type, in order to shape the trace of the spot into a more or less perfect circle.

For testing of photographic shutters, the deflecting voltage can be

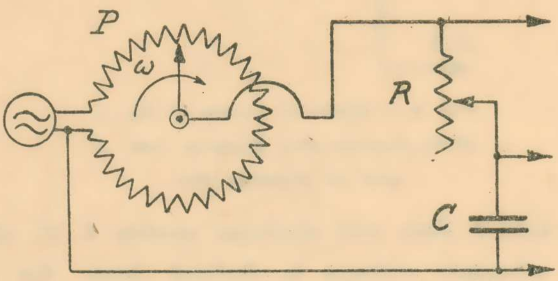

Fig.7a.—*Continuous Sinusoidal Scanner (Television type).*

taken from the 50-cycle mains supply line. Both switch S, in Fig. 5, and potentiometer P, in Fig. 7, can be operated by one single mechanical shift of the slider **a**, combined with a sliding contact **b**. This contact **b**, connected to I, is insulated from slider **a** and closes the circuit, as long as **b** remains in contact with the metal band **c**, connected to II. On the screen, a very brilliant spiral trace develops, whose total duration can be varied up to approximately 1 second, as already explained. The shutter is operated at the moment **b** comes in contact with **c**, with the obvious result that only a part of the entire spiral curve, corresponding to the time the shutter remained open, is recorded on the photographic plate. Shutter speeds down to 0,2 sec are thus very easily tested, whereas the longer exposures, up to 1 sec, require some more careful adjustments.

When high-frequency deflecting voltage is used, a fully electronic device should be used in place of the mechanical arrangement Fig. 7. Its layout depends to a great extent on the nature of the transient-time phenomenon to be measured.

If transients of a duration of the order of one millionth of a second are to be tested, the frequency of the deflection voltage has to be raised up to about 1000 kc. p. s., corresponding to a wavelength of 300 m. At this deflecting frequency the spot moves 2π radians in 1 microsecond. Because the central angle of an arc, as recorded on a photographic plate, can be measured close to $\pm 1°$, the above deflecting frequency allows the evaluation of phenomena close to $\pm 2{,}8 \cdot 10^{-9}$ sec, at least as far as the present method is concerned, all possible inertia phenomena are carefully avoided and the *exact* frequency is held perfectly constant.

Assuming the accelerating voltage $E = 8$ kV, the diameter of the spot $d = 0{,}02$ cm, the current intensity in the cathode ray beam $i = 1$ microampère and the efficiency of the recording method with camera and lens $n = 0{,}07$, Manfred von Ardenne's formula[1] yields to a maximum speed v of the spot, still producing a photographic density of 0,1 over fog, of:

$$v = \frac{400 \cdot 1 \cdot 8 \cdot 0{,}07}{0{,}02} = 11200 \text{ m sec}^{-1},$$

400 being a coëfficient.

Assuming further the radius of the external orbit to be 2,5 cm, the actual linear velocity of the Spot in the above example is 157000 m sec^{-1}. As it was felt that considerable progress has been accomplished in the construction of C. R. Tubes since (1933) von Ardenne established his coëfficient 400, an actual test was made, in spite of the above figures.

The photographic plates were artificially oversensitized, by keeping them during 8 days in a box containing some Hg, and they further were

[1] M. VON ARDENNE, Die Kathodenstrahlröhre, Berlin, 1933, S. 224.

given an adequate pre-exposure, according to R. W. Wood's method After processing, the negative appeared to bear no marks of a trace. However, on somewhat closer examination in reflected side-light, over a black background, it was possible to guess the presence of a faint spiral trace. The plate was then given the usual treatment for this kind of ultra thin

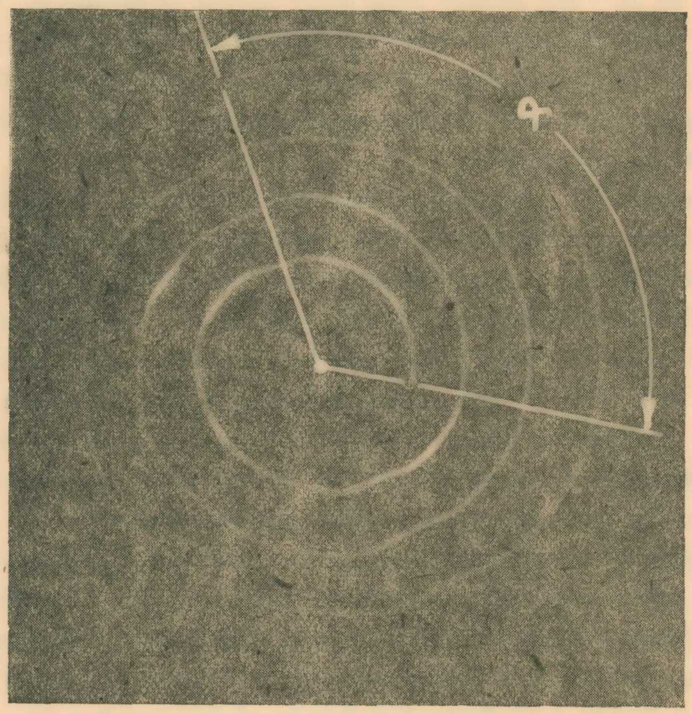

Fig. 8.—*Spiral trace (running clockwise towards centre) at deflecting frequency of* $\sim$ 1000 kc. p. sec, *where* $\alpha = 120{,}7^{\circ}$ $\therefore$ *time for angle* α: $t_{\alpha} = 120{,}7 \cdot 2{,}8 \cdot 10^{-9} = 0{,}34 \cdot 10^{-6}$ sec. *Total duration* t *of Transient:* $t = 3 \cdot 1 \cdot 10^{-6} + 0{,}34 \cdot 10^{-6} = 3{,}34 \cdot 10^{-6}$ sec. *Tangential velocity* $\dot{v}$ *of Spot at Origin of Spiral (actual radius there* $\sim$ *2,5 cm)* $\sim$ 157 km sec^{-1} *(Unretouched enlargement).*

negatives: re-enforcing with mercury, copying in beamed light on hard diapositive plate, re-enforcing the latter, etc. In Fig. 8 a print is shown of the fifth or sixth consecutive plate obtained by this cascade-like «amplifying» method.

Finally, in Fig. 9, a photogram of a series of brief electrical transients, fed to the Z-axis of the C. R. Oscilloscope, is shown. This is a direct-contact photogram, obtained simply by pressing the film with the palm of the hand on the screen of the Tube. Owing to the curvature of the screen, the contact can not be perfect over the entire area but, apart from this

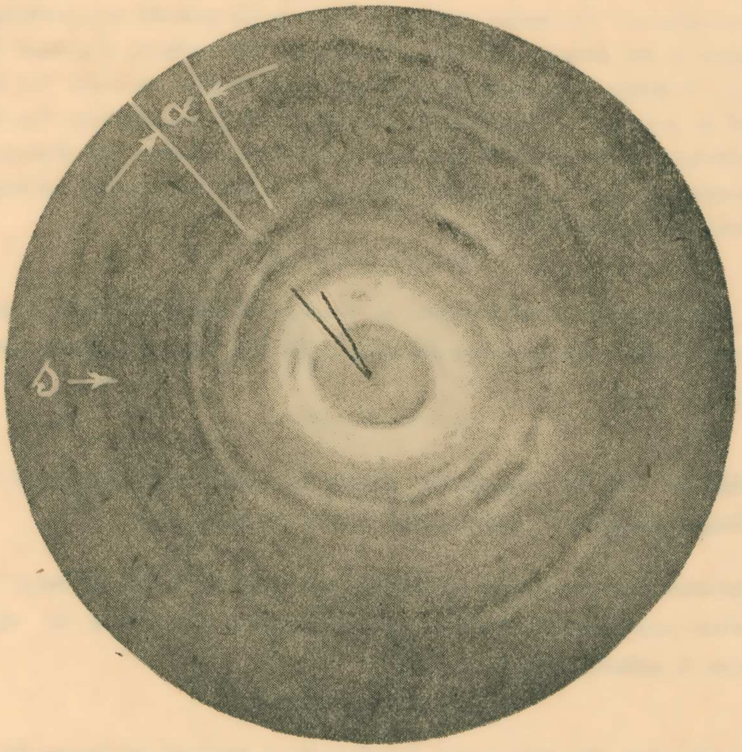

Fig. 9. — *Spiral trace (expanding from centre) at deflecting frequency of* ~ 2000 kc. p. sec. *Series of short electric transients fed to* Z - axis. *Shortest transient:* $\alpha = 10{,}44^{\circ}$. *Thus, duration* t_{α} *of above transient equals:* $10{,}44 \cdot \frac{5 \cdot 10^{-7}}{360} = 1{,}45 \cdot 10^{-8}$ sec. *Actual radius* r *at this point:* $r \cong 2{,}1$ cm. *Thus tangential velocity* v *of Spot during Transient equals* $\frac{2\pi \cdot 2{,}1}{5 \cdot 10^{-7}}$ cm $sec^{1} \cong 264$ km sec^{-1}. *Radius of transient near edge of circle* $\cong 4$ cm. *Thus, greatest spot velocity distinctly recorded equals* ~ 500 km sec^{-1}. *Attention is drawn to the regular and dense (Television-like) scanning in areas, such as marked by* s, *where contact between film and screen was perfect.* *(Unretouched enlargement).*

drawback, which does not exist with a certain type of German Radar C. R. Tubes whose screen is entirely *flat,* this method allows the recording of much greater spot speeds, than possible with the common method of camera and lens.

If, in Fig. 7a, the slider of potentiometer P is arranged to rotate at a uniform speed generating about 20 «frames» per second, a spiroidal scan results, similar to the linear scan in Television.

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ΠΕΡΙΛΗΨΙΣ

Διὰ τῆς παρούσης ἀνακοινώσεως ἡ γνωστὴ μέθοδος Brailsford μετρήσεως βραχυτάτων χρονικῶν διαστημάτων βελτιοῦται διὰ τῆς χρησιμοποιήσεως σπειροειδοῦς σαρώσεως.

ΖΥΜΟΧΗΜΕΙΑ.— Ἡ διὰ τῆς ἰλύος οἴνου ζύμωσις γλεύκους, *ὑπὸ* ***Ὀρέστου Ι. Στεφανοπούλου****. Ἀνεκοινώθη ὑπὸ κ. Α. Βουρνάζου.

Ἡ ἐργασία αὕτη σκοπεῖ νὰ καταδείξῃ τὴν ὀρθότητα τῆς χρήσεως τῆς ἰλύος ρητινῶν οἴνων πρὸς ζύμωσιν γλεύκους καὶ νὰ καθορίσῃ τοὺς ὅρους ὑφ' οὓς δέον νὰ ἐφαρμόζηται ἡ μέθοδος αὕτη [1].

I.— ΠΑΡΑΤΗΡΗΣΕΙΣ

Εἰς τοὺς περὶ τὴν οἰνοχημείαν ἀσχολουμένους προξενεῖ ἐντύπωσιν ὅτι πλεῖστοι οἰνοποιοὶ χρησιμοποιοῦσιν ἰλὺν ρητινίτου οἴνου πρὸς ζύμωσιν γλεύκους.

Οὕτω παρατηρεῖται ὅτι μετὰ τὴν διάθεσιν τοῦ ρητινίτου οἴνου (οἴνου ταχείας καταναλώσεως) μὴ ὑφισταμένου μετάγγισιν, δὲν ἀπορρίπτεται ἡ ἀπομένουσα ἰλὺς τοῦ οἴνου ἀλλὰ κλείεται ἑρμητικῶς ἐν τῷ βυτίῳ μετὰ προηγουμένην πλήρωσιν τοῦ κενοῦ χώρου τούτου διὰ διοξειδίου τοῦ θείου, προφυλάττεται δὲ οὕτω ἡ ἰλὺς τοῦ οἴνου ἀπὸ ἐνδεχομένων ἀλλοιώσεων.

Ἡ οὕτω πως διαφυλαχθεῖσα ἰλὺς χρησιμοποιεῖται ὡς μητρικὴ ζύμη πρὸς ζύμωσιν γλεύκους τοῦ ἐπιόντος ἔτους.

Ἡ ἐπιμονὴ εἰς τὴν τοιαύτην τῆς ἰλύος χρησιμοποίησιν καὶ δὴ κατὰ παράβασιν οἰνολογικοῦ κανόνος, καθ' ὃν τὸ πρὸς ζύμωσιν γλεῦκος δέον πάντοτε νὰ τίθεται εἰς

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* **OREST. STEPHANOPOULOS, Fermentation du môut avec la lie de vin résiné.**

[1] Εὐχαριστῶ τὸν κ. Α. Βουρνάζον διὰ τὰς γενομένας εἰς ἐμὲ ὑπ' αὐτοῦ ὑποδείξεις πρὸς πληρεστέραν διερεύνησιν τοῦ θέματος τούτου.