[HIGH COURT OF AUSTRALIA.]

ADHESIVES PROPRIETARY LIMITED . . APPELLANT;
APPLICANT,

AND

AKTIESELSKABET DANSK GAERINGS-INDUSTRI AND ANOTHER . . } RESPONDENTS.
RESPONDENTS,

Patent—Improved process of manufacture—Subject matter—Specification—Sufficiency—Ambiguity—Misrepresentation.

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SYDNEY, 1934, *Feb.* 14-16, 19; *June* 19-22, 25, 26; *Oct.* 3.

Evatt J.

SYDNEY, 1934, *Dec.* 10-14. 1935, *July* 15.

Rich, Starke, Dixon and McTiernan JJ.

Letters patent were granted to A in respect of "improvements in the manufacture of yeast." In A's specification the two theretofore-known methods of propagation of yeast were referred to. One method was to sow seed yeast in a "mash" of malted cereals. In the other, called the "air-grown" method, a "wort" was obtained from the mash by filtration and the seed yeast sown in that; and the wort was diluted from time to time by further "washings" obtained from the mash by filtration. A defect in both these processes was that the yeast developed under unfavourable conditions: the mash or wort became during fermentation poorer in nutrient substance owing to the consumption of substance by the propagation of the yeast, and the formation of alcohol retarded the propagation of yeast. In the air-grown method, aeration and dilution of the wort reduced the proportion of alcohol, but, as pointed out in A's specification, the result was that "the alcohol produced will be lost, as it will not be feasible, in practice, to recover the alcohol when diluted beyond a certain limit." Under A's process the yeast was to be sown in a diluted wort or mash, and then the process was to be controlled so that the consumption of nutrients caused by the growth of yeast was balanced by the addition of stronger nutrients to the wort or mash. A claimed "a process for the manufacture of yeast . . . in which . . . a nutritive substance concentration suitable for the formation of yeast is maintained in the wort or mash during the run of the fermentation, while by the addition of the necessary quantities or wort or mash of higher concentration, any variations in the concentration of the nutritive liquid due to the general vital activity of the yeast are equalized or compensated, whereby alcohol is formed in considerable quantities, which alcohol is either recovered or assimilated by the yeast, but only during the subsequent period of fermentation." The specification stated

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that the process gave "a quite appreciable formation of alcohol, so that the alcohol may either be caused to disappear again slowly during the process, or may be caused to remain, wholly or partially, as desired" and allowed "the manufacture to be adjusted according to the varying state of the market for yeast and alcohol"; and that "uncommonly large" yields of yeast might be obtained by the process although "quite considerable quantities of alcohol may be present during the fermentation."

Held, by *Evatt* J.:—

(1) There was no foundation for an objection to the validity of the patent on the ground of want of subject matter. The process invoked a new principle and, although it might not appear logical and simple, it swept aside all previous notions. The principle was embodied in a new method of manufacture which made a great step in advance of previous knowledge and possessed very great utility.

(2) The question whether "assimilation" was in truth the cause of the disappearance of the alcohol was unimportant. An error in theory, although carried into the very terms of a claim, does not vitiate a patent if otherwise valid, so long as from a practical point of view the public concerned are fairly given possession of the invention. The process was not dependent upon the cause and for all practical purposes of the trade it was immaterial whether the reason for the disappearance of the alcohol was that it was acted upon by a catalytic agent or converted by an oxidising enzyme.

(3) On a proper understanding of the invention and the specification, there was no insufficiency, and, in particular, there was none in not giving instructions as to the concentrations of wort favourable to yeast production, because the main purpose of the invention was to maintain the concentration throughout the process so as to balance consumption of nutrient substance against the growing activities of the yeast colony, and the general direction applied though the degree of concentration maintained might be varied in different conditions.

(4) The invention was not anticipated.

(5) The objection that the specification was ambiguous failed upon an examination of its meaning.

Held, by the Full Court, affirming *Evatt* J.:—

(1) The process was a new method of manufacture and the invention possessed subject matter.

(2) The invention consisted in applying a new method or principle of procedure to existing knowledge and practice of yeast production and there was no insufficiency in failing to specify matters necessary to the production of yeast but independent of the invention and involving choice and judgment by those skilled in the art as known and practised.

(3) The specification did not claim results which the invention would not achieve.

(4) It was not bad for ambiguity.

(5) The invention was new.

APPEAL from *Evatt* J.

Adhesives Pty. Ltd. presented a petition to the High Court under sec. 86 of the *Patents Act* 1903-1932, for the revocation of letters patent, No. 13,229, granted on 7th November 1919, to Aktieselskabet Dansk Gaerings-Industri, of Copenhagen, Denmark, in respect of an invention by one Soren Sak for "improvements in the manufacture of yeast." The petitioner stated that it was duly authorized by the Attorney-General for the Commonwealth to present the petition; that it was a company duly incorporated in the State of New South Wales, and engaged, *inter alia*, in the manufacture of yeast and yeast products; and that Aktieselskabet Dansk Gaerings-Industri was the registered proprietor of the letters patent which were and always had been invalid and of no effect. The grounds, other than ground 1, which was not proceeded with, set forth in the particulars of objection upon which the petition was based were, as amended, substantially as follows:—(2) The alleged invention was not novel at the date of the grant by reason of (*a*) prior publication, and (*b*) prior common general knowledge. The particulars of prior publication relied upon were in respect of three British patents granted in 1880, 1888 and 1904 respectively to William Robert Lake, William Phillips Thompson and Evariste Vignier respectively, the specifications of which had been available for inspection at the patent offices of New South Wales and Victoria shortly afterwards, and in the library of the Commonwealth Patent Office since 1905. (3) The alleged invention was not proper subject matter for a patent. (4) The alleged invention was not useful. (5) The specification did not particularly describe the nature of the alleged invention or the manner in which it was to be performed in that no instructions were given in respect to many matters referred to. (6) The specification and claims of the alleged patent did not adequately define the extent of the monopoly sought to be protected. (7) The specification and claims did not give sufficient information to enable the public to ascertain the scope and ambit of the claims. (8) Claim 1, both by itself and as incorporated by reference to claims 2 and 3, was ambiguous in respect of the following expressions: (*a*) "in accordance with the so-called differential management of the fermentation," (*b*) "the necessary

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quantities of wort or mash of higher concentration," (*c*) " whereby alcohol is formed in considerable quantities," and (*d*) " but only during the subsequent period of the fermentation." (9) The patent was obtained by the false suggestion that the process described in the specification was a process whereby the amount of alcohol present at the end of the process might be controlled and varied and that the process thus allowed the manufacture to be adjusted according to the varying state of the market for yeast and alcohol; these suggestions were wholly false and devoid of foundation. The complete specification was as follows :—

" ' Improvements in the manufacture of yeast.' [*Col.* 1] We, Aktieselskabet Dansk Gaerings-Industri, manufacturers of yeast, of Snaregade 12, Copenhagen, Denmark, hereby declare this invention and the manner in which it is to be performed to be fully described and ascertained in and by the following statement :—

In known processes for the manufacture of yeast the yeast to be used for propagation is either sown into the total quantity of mash, as in the skim-yeast (Vienna-yeast) method, or, as in the air-grown yeast method, first into the first wort which is then, subsequently, during aeration, diluted by addition of washing water so as to make a certain definite quantity of final wort wherein the fermentation is completed.

In both cases the yeast propagates in a mash or wort becoming, during the fermentation continuously poorer in nutritive substance, one of the reasons for this being the consumption of substance caused by the propagation of the yeast. In the air-grown yeast method the concentration of the nutritive liquid is reduced not solely on account of the consumption of substance due to the propagation of the yeast, but also on account of the nutritive solution being diluted by addition of washing water, which addition is continued during the entire washing process. [*Col.* 2] In the said methods the individual yeast generations will develop under very different conditions of life, their development commencing in a nutritive liquid of high concentration, i.e., in a surplus of nutritive substance, while the last generations will develop under unfavourable conditions of life, i.e., in a weaker nutritive solution, where they will be wanting nutritive substance. Furthermore, the alcohol formed during the

fermentation according to the above-mentioned methods of fermentation will have a retarding effect on the formation of yeast. The retarding action of alcohol on the yeast formation is especially prominent in the skim-yeast (Vienna-yeast) method. In the air-grown yeast method, it has been attempted to remedy this drawback, viz., the alcohol's retardation of the formation of yeast, by selecting suitably weak solutions, in which the alcohol formed could not materially injure the propagation of yeast. This process, however, has for effect that the alcohol produced will be lost, as it will not be feasible, in practice, to recover the alcohol when diluted beyond a certain limit.

In spite of the attempts to remedy these drawbacks, there will always remain, by the said fermentation methods the main drawback that the yeast during its development [*Col.* 3] must always work in a wort or mash becoming constantly poorer in nutritive substance, so that the last generation will have to fight against conditions of life which become constantly more unfavourable.

The present invention has for its object that the yeast is given as far as possible, uniform and favourable conditions of life during the entire fermentation process without using other nutritive substances than those utilized in the heretofore-known fermentation process. This is possible when the usual nutritive substances (that is, for instance, mash and wort) are supplied to the yeast in an entirely different manner from that heretofore known. Experience has shown that the desired result is attained, if the yeast is sown in a diluted wort or mash suitable for the propagation of yeast, and if the concentration of the nutritive liquid is maintained by equalization or compensation of the consumption of substance, so that the fermentation is directed in a manner which may be called differential.

In contradistinction to the heretofore followed practice, the process may be commenced for instance by sowing the yeast into the last or a mixture of the last and the last but one washing water (the term 'washing water' being taken to mean the liquid flowing from the filtration plant), whereafter addition is made of the stronger washing waters obtained at the beginning of the filtration, and of the first wort, according to requirements in order that the concentration

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may be maintained in spite of the consumption of substances occurring.

An extensive series of practical experiments have shown in the production of good bakery yeast with uncommonly large yield, according to the present process, that even quite considerable quantities of alcohol may be present during the fermentation, and the process should therefore be carried [out] not only in such manner that such quantities of alcohol are formed and are present during the fermentation but also so that the alcohol is not utilized by the yeast until during the further run of the fermentation, the alcohol being utilized or assimilated. The principal object of the novel process for the production of yeast is to provide an easily obtainable approximate compensation or equalisation of the variations occurring, in consequence of the consumption of substance, in the concentration of the fermenting wort or mash. The object of the invention is, in other words, the management of the fermen- [*Col.*4] tation in a manner which may be called differential.

According to the present invention the concentrations during the fermentation are not only adjusted in such a manner that they become favourable to the propagation of yeast, but they are also at the same time adjusted in such a manner that they furthermore give a quite appreciable formation of alcohol, so that the alcohol may either be caused to disappear again slowly during the process, or may be caused to remain, wholly or partially, as desired.

The process thus forms a kind of regulator for a formation and conversion of alcohol going on co-ordinarily with the attainment of high yields of the best yeast. By the present process there may be used per unit volume of the fermenting solution, quantities of mashing material corresponding at least to those used by the heretofore-known air-grown yeast method. This process consequently allows relatively smaller quantities of air to be used than in the known processes by which smaller quantities of mashing material, per unit volume of fermenting solution are used, and it will therefore be seen that the present process offers advantages in respect to increased capacity of the plants. The advantages attained by the process amply outweigh the costs of the increased supervision made necessary, especially at the start, when the process is introduced in a factory.

The yeast thus produced, while quite considerable quantities of alcohol are present, appears in quantities corresponding to a yield of about 60% or more and, besides, it possesses internal and external qualities of exceedingly high value.

EXAMPLE I.

First a mash of 15° Balling and composed in usual manner is filtered. The original wort and the first washing waters—a mixture whose concentration may vary between wide limits and whose specific gravity here may be assumed to be about 10° Balling are conveyed, in hot state, into a special receptacle, in which the mixture is heated once more to 70 to 75°C. The third washing water or a portion thereof, mixed with the last washing water in such a proportion that the strength of the mixture will be 1.5 to 2.5° Balling, is conveyed through the cooler to the fermenting vat where yeast is added, while the temperature is maintained at about 30°C. Thereafter aeration commences and then, after the lapse of 2 to 3 hours, the hot and more concentrated wort is added, preferably [*Col.* 5] continuously and during intense aeration and in such manner that the addition of the wort will take 10 to 11 hours. Hereafter, during decreased aeration, the entire wort is allowed to ferment for one or two hours more, and the separation of the yeast then commences. As the wort contains quite unusually large quantities of yeast, it will be preferable to let some water run with it into the centrifugal straining apparatus.

During a fermentation as carried out in the above example, alcohol will be produced in quantities which may amount to 20% or more of the raw material corresponding to the quantity of wort present in the fermentation vat.

In fermentations as those here referred to, the alcohol will be present or may be present in a concentration enabling it to be recovered commercially.

The addition of the usual nutritive salts may be performed in usual manner, for instance, during the fermentation, or even in the wort before the sterilization.

By a slight variation of the temperature the aeration or the manner in which the wort is added, the amount of alcohol present at the end of the process may be varied.

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The present process thus allows the manufacture to be adjusted according to the varying state of the market for yeast and alcohol.

The process may be used for cultivation of yeast to be sown (seed yeast, mother yeast) according to the air-grown yeast method and according to the skim-yeast (Vienna-yeast) method.

It will frequently be advantageous to sow a very liberal quantity of mother yeast or seed yeast, and experience has shown that it may be of advantage to use a quantity of seed yeast to upward of 60% of the entire quantity of mashing material used.

EXAMPLE II.

The mashing process is effected in usual manner, and the mashing material used is of ordinary kind and composition. There may be used for example a mash volume of 18,000 litres, produced from 1,200 kilos of maize, 1,350 kilos of barley, and 450 kilos of malt-culms, in total 3,000 of mashing material. (Larger or smaller quantities of molasses may also be used in connection with barley and malt-culms.) The barley used should preferably be in the shape of malt.

The processes of saccharization, acidulation and sterilization are conducted in ordinary manner. The saccharization takes place for two to three hours at about 65°C. The [*Col.* 6] acidulation process is preferably started at 55°C. and is carried out in known manner for fifteen to sixteen hours. The sterilization temperature is about 70°C.

The filtration may be directed in such a manner that the wort which leaves the filter without washing, the first wort or main wort, is mixed with such quantity of the first washing water that the resulting mixture amounts to 210 hectolitres of 7.1° Balling (undiluted wort corresponds to 10° Balling). These 210 hectolitres are set aside, temporarily, and are kept at a suitably high temperature, say about 70°, or a suitably low temperature, say about 10°C. in order to avoid infections. The filtering process is continued, while further washing is performed, so as to produce, besides the above-mentioned mixture, a mixture consisting of 196 hectolitres, which is collected in the fermentation vat, and into which mixture the seed yeast is sown. To this wort in the fermentation vat, which is on 1.7° Balling, 10 kilos of sulphate of ammonia are added. Then 600

kilos of seed yeast, and aeration is carried out for 2½ hours, at the rate of 700 cubic metres of air per hour.

For the following hour the quantity of air is increased to 1,800 cubic metres and, during the next 9 hours, 2,800 cubic metres of air are supplied per hour. Then the amount of air is reduced, for the next hour, to 1,400 cubic metres, and then during the next hour to 700 and then to 200 cubic metres per hour, which rate of aeration is maintained until the end of the fermentation. Two and a half hours after the fermentation has been started, addition is made of 10 kilos of sulphate of ammonia and 3½ hours after the fermentation has been started, a methodical addition of first wort is commenced, at the rate of 1,850 litres per hour for 9 hours and then about 2,220 litres per hour for the next 2 hours. Besides the above-mentioned amounts of sulphate of ammonia, addition is made 3½, 5½, 6½, 7½, 8½ and 9½ hours after the commencement of the fermentation, of 10 litres of 25% ammonia water each time.

During the fermentation, a temperature of about 30°C. is maintained as far as possible.

When the fermentation commences, the wort in the fermentation vat is on 1.7° Balling, at the end of the fermentation it is on 2.6° Balling which is mainly due to the influence exerted on the specific gravity of the wort by the large amount of yeast contained in the wort. After the yeast has been re- [*Col.* 7] moved by a centrifugal machine, the wort thus treated is on 1.1° Balling.

The run of the fermentation process is seen clearly and distinctly from the following table, in which the column farthest to the left indicates the time from 5.30 when the fermentation is initiated, until 9 p.m. when it is finished.

	I.	II.	III.	IV.	V.	VI.
At 5 1/2 a.m. the fermentation was started.						
„ 6 1/2 „	196	0.434	85.0	166.5	229	72.7
„ 8 „	196	0.434	85.0	166.5	229	72.7
„ 10 „	232	0.378	87.6	172	409	42.2
„ Noon	267	0.268	71.6	140	589	23.8
„ 2 p.m.	303	0.160	48.5	95	769	12.3
„ 4 „	339	0.074	25.1	49.2	949	5.2
„ 6 „	378	0.022	8.3	16.3	1145	1.4
„ 9 „	398	0.010	4.0	7.8	1252	0.6

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In the above table I indicated the volume of the nutritive liquid in the fermentation vat, i.e. the 196 hectolitres of wort plus the additions made at various periods. The total finishing volume ought to be 196 plus 210 equalling 406 hectolitres, but 406 minus 398 equalling 8 hectolitres of water have been blown away.

Column II. shows the amount of alcohol contained in the wort expressed in per cent by weight.

Column III. corresponds to the alcohol contents of the wort expressed in kilograms of pure alcohol.

Column IV. indicates—figured as dextrose—the quantities of sugar corresponding to the quantities of alcohol in column III. figured according to the equation :—

$$C_6 H_{12} O_6 \longrightarrow 2C_2H_5OH + 2CO_2$$

Column V. shows the quantities of sugar (expressed in kilograms of dextrose) which have been added, at various hours, to the fermenting wort.

Column VI. is arrived at by comparing the figures in column IV. with the corresponding [*Col.* 8] figures in column V., and its figures indicate what percentage of the sugar added has been converted into alcohol at the hour concerned.

Having now fully described and ascertained our said invention and the manner in which it is to be performed, we declare that what we claim is :—

1. Process for the manufacture of yeast, especially air-grown yeast, in which, in accordance with the so-called differential management of the fermentation, a nutritive substance concentration suitable for the formation of yeast is maintained in the wort or mash during the run of the fermentation, while by the addition of the necessary quantities of wort or mash of higher concentration, any variations in the concentration of the nutritive liquid due to the general vital activity of the yeast are equalized or compensated, whereby alcohol is formed in considerable quantities, which alcohol is either recovered or assimilated by the yeast, but only during the subsequent period of the fermentation.

2. A process as claimed in claim 1, in which the said process is used in the cultivation of yeast to be sown (seed yeast, mother yeast).

3. A process as claimed in claims 1 and 2 in which seed of such quantity of yeast (seed yeast, mother yeast) is employed as corresponds to upward of 60% of the mashing material used.

4. A process for the manufacture of yeast substantially as described."

Commercial yeast is an aggregate of a vast number of yeast cells. Yeast is a microscopic single cell organism, the scientific name of which is saccharomyces. There are many different kinds of this organism. The yeast cell lives in a fluid medium of suitable composition for its growth; it obtains its substance from the required materials in the solution; the fluid medium in which the yeast grows must therefore contain in solution the various constituents that are necessary for the growth of the yeast, and these constituents must exist in the solution in forms in which they are capable of assimilation through the walls of the cell. The main nutritives required by the yeast cell are sugar and nitrogen in suitable chemical forms. Other things, such as phosphorus, are also essential but in smaller quantities. Some forms of sugar are not assimilated by some forms of yeast, but it can be assumed that the specification only refers to those forms which are suitable for the particular type of yeast. Besides utilizing sugar for the purpose of nutriment, the yeast cell also has the property, which is of great commercial value, of converting one molecule of sugar into two molecules of alcohol and two molecules of carbon dioxide, and in this way a given weight of sugar so converted yields approximately half that weight of alcohol and half that weight of carbon dioxide. The alcohol which the yeast cell produces is, if present in the solution in sufficient quantities, inimical to the growth of the yeast cell. Increase of the yeast takes place by budding, that is to say, a small daughter cell appears on the surface of the mother cell and may ultimately become detached. In a normal yeast brew there are usually about eight successive generations. The rate of alcohol production and the rate of growth of the yeast are very variable quantities, and prior to Sak's patent it was generally accepted that the conditions which were favourable to a large yield of alcohol were not favourable for a large growth of yeast, and vice versa. Industrially, yeast is used principally in brewing, wine making, alcohol production, spirit distillery and

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bread making. For the bread industry yeast is generally supplied in a form known as "pressed yeast." A cake of pressed yeast consists of myriads of yeast cells which have been first separated from the mother liquid, generally by centrifuging, and from the mass so obtained further water is expressed by pressure. The pressed yeast thus manufactured still contains, chemically, about 72 per cent of water, most of which represents the fluid material within the cell. In yeast manufacture there are, broadly, two stages. In the first stage the object is to prepare a medium which will contain in solution the various ingredients necessary for the growth of the yeast. In the second stage of the process the prepared material is innoculated with specially selected and prepared yeast, called "seed yeast," and that stage of the manufacture aims at obtaining as much yeast as possible from the materials employed in the first stage. When the nutritive liquid in which the yeast was grown has become exhausted, or practically exhausted, the process is brought to a close by the separation of the yeast cells from the liquid in which they have been caused to grow. The meaning of various technical terms used herein is as follows:—"Mash."—The grains, or whatever other vegetable materials are used for providing the necessary sugar, after being crushed, are mixed with water, and the mass is suitably treated for the purpose of extracting the desired ingredients. The whole mass thus treated is called the "mash." "Wort" is the liquid filtered off from the mash. "Vienna yeast" is yeast grown in the mash itself. "Air-grown yeast" is yeast grown in a wort through which air is caused to bubble from air pipes at the bottom of the tun. "Seed yeast" is yeast used for innoculating the commercial brews. It is specially prepared from a single selected cell, or several selected cells, which is or are propagated under special conditions designed to ensure particularly that the whole batch of seed yeast will be of suitable type and quality and as free as possible from foreign contaminating organisms. "Malt culms."—When a cereal grain, such as a wheat seed or barley seed, is exposed to moisture it begins to sprout; when this occurs, substances, called enzymes, within the grain proceed to act upon the starch and proteins stored up in the grain and to convert them, as far as starch is concerned, into sugar, and as far as the proteins are

concerned, into more easily available nitrogenous materials for the purposes of the young plant. When the sprout is about an inch long the germination is stopped by heat and drying, and the small sprouts are called "malt culms." "Balling" is a measure of density used in the fermentation industry. 1° Balling is the density of a solution of one part by weight of sugar in 100 parts by weight of water; 2° Balling is the density of 2 parts by weight of sugar in 100 parts by weight of water, and so on. "pH."—This is a symbol used for indicating the hydrogen-ion concentration of a liquid. The hydrogen-ion concentration of a liquid refers to the quantity of free hydrogen ions in that liquid at a given moment, and according to such concentration it is either neutral or acid or alkali. pH7 represents the concentration when the liquid is neutral; pH values below 7 are acid and those above 7 are alkaline. Acidity is measured in two ways, namely, total acidity and pH acidity. The same applies to alkalinity. The total acidity of a given quantity of a given substance is measured by what is called titration, that is to say, by the quantity of standard alkali that it will neutralize. Titratable acidity is therefore the total available acidity. But some acids or acid substances operate much more slowly than others according to the differences in their hydrogen-ion concentration in the particular solution, and it is this difference that is indicated by the pH value, so that two solutions may have the same titratable acidity, but different pH values, and vice versa.

The respondents to the petition were Aktieselskabet Dansk Gaerings-Industri Ltd., and Mauri Brothers & Thompson Ltd., a licensee under the patent.

The petition was heard by *Evatt* J., who, by consent of the parties, appointed Dr. R. K. Murphy and Dr. V. M. Trikojus to carry out certain experiments and to furnish a report thereon, and also as assessors to assist his Honour. The parties also consented to his Honour consulting the assessors out of court, and also having recourse to text books and scientific works on the subject.

Further material facts appear in the judgments hereunder.

Bonney K.C. and *Gain*, for the petitioner.

Flannery K.C. and *W. J. V. Windeyer*, for the respondents.

Cur. adv. vult.

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1934, Oct. 3.

EVATT J. delivered the following written judgment:—

This is a petition for the revocation of letters patent No. 13,229. It describes itself as being for "Improvements in the manufacture of yeast." The date of the application and complete specification was November 7th, 1919.

The grounds of objection as set out in the particulars have been slightly amended by (1) the abandonment of ground 1 (that the person named as actual inventor—one Soren Sak—was not the actual inventor), and (2) the abandonment by the petitioner of (*a*) Levy, (*b*) Claudon and Vigreaux, and (*c*) Kamienski, three prior publications referred to in particular 2 as (I.), (II.) and (IV.) respectively.

Meaning of Specification.

The first question to be considered is the meaning of the complete specification, for upon that necessarily depends the force of many objections which have been taken. The specification states at the outset that in both the skim-yeast, i.e., the Vienna yeast process, and in the aerated process, of yeast manufacture, the yeast propagates in a mash or wort which becomes continuously poorer in nutritive substance during fermentation. The result is, it is asserted, that there is a growth of yeast "under very different conditions of life," the first generations developing in a nutritive liquid of high concentration, while "the last generations" have to encounter "unfavourable conditions of life."

Some argument was directed to the question whether the specification intends to limit the reference "unfavourable conditions" to the last generation of all; but it is clear from col. 2 that it does not so intend and that it is intended to assert that in the latter end of the processes previously employed there is no longer a sufficiency of nutritive substances.

The specification next points out that in the two methods of manufacture usually employed, the alcohol formed during fermentation retards the formation of yeast. There has been an attempt to overcome this factor in the air-grown yeast method, by selecting suitably weak solutions of wort in order to prevent alcohol from being formed in quantities sufficient to retard the propagation of yeast. "This process, however," the specifier says, "has for effect

that the alcohol produced will be lost as it will not be feasible in practice to recover the alcohol when diluted beyond a certain limit."

When he comes to the end of the second column, the specifier has completed his preliminary statement of the problem. His basic declaration is that both the Vienna yeast method and the aeration method, as known and employed in 1919 in the Commonwealth of Australia, present practical difficulties to the manufacturer. In the first place, yeast propagation itself is unsatisfactory because an adequate concentration of nutritive substance is not maintained during the process, but, secondly, whereas the alcohol formed in strong-brew fermentation processes detracts from the successful production of yeast, the existing method in air-grown yeast production of using very weak brews, whilst certainly preventing enough alcohol from being produced to injure yeast production, is wasteful, because the alcohol produced has, for all practical purposes, to be treated as irrecoverable.

What, then, are the stated purposes of the present invention?

(I.) Its first and main purpose is clearly stated. It is to improve the manufacture of yeast so as to obtain high yields. And the method or process adopted for achieving such an end is to secure "as far as possible uniform and favourable conditions of life during the entire fermentation." The process is to operate by sowing the yeast in a diluted wort and then maintaining the concentration of the nutritive liquid, having regard to the gradual consumption of nutritive substance by the growing yeast colonies. The essence of the method is that "the concentration may be maintained in spite of the consumption of substances occurring" (col. 3). Thus the inventor provides an "easily obtainable approximate compensation or equalization of the variations occurring, in consequence of the consumption of substance, in the concentration of the fermenting wort or mash" (col. 3).

This method of compensating for loss of nutritive substance throughout the whole process of fermentation is illustrated by the suggestion that the yeast should be sown, not into the strong wort, but into the last washing water, or a mixture of the last and the last but one, and that, subsequently, additions should be made from

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a reservoir, consisting of the first wort and the stronger washing water (col. 3).

The specifier describes his method as the application of the " usual nutritive substances (that is, for instance, mash and wort) " in such a manner that the management of the fermentation may be called " differential." This word vividly describes the outstanding feature of the invention. Under the new process, yeast is to be sown in a diluted wort or mash suitable for propagation, and then the process is to be controlled so that the consumption of nutrient substances caused by the propagation and growth of yeast is balanced, and no more than balanced, by adding a sufficient supply of stronger nutrient to the liquid in which the yeast is propagating. The word " differential " implies a balancing of one rate of change against others. Sak's method of controlling the process is quite analogous—as is suggested —to the difficulty presented, not so much in *solving* a differential equation as to the preliminary and greater difficulty involved in *writing it down*. He claims that a certain relation exists in which the element of time (the fermentation process takes many hours) becomes all-important. In this way, he emphasizes, not only by his use of the term " differential," but throughout the specification and by his particular examples and directions, that he is concerned with the adjustment of yeast growth (at a certain rate), consumption of nutrient substances as a result of such growth, and the furnishing of additional nutrient substances at such a rate as will compensate for the consumption of substances, having regard to the rate at which they are consumed. It is not merely a question of adding additional nutritive substances in a haphazard or unordered way, but of adding them in a particular way so as to compensate for consumption losses.

(II.) The inventor also states that an incidental but important result may also be obtained from his process. He mentions at an early stage of the specification that the problem of alcohol recovery has also to be attacked. He asserts that " uncommonly large yields " of yeast have been obtained from his process, although " quite considerable quantities of alcohol may be present during the fermentation " (col. 3). He suggests that his process " should " be carried out, " not only in such manner that large quantities of

alcohol are formed and are present during the fermentation, but also so that the alcohol is not utilised by the yeast until during the further run of the fermentation, the alcohol being utilised or assimilated" (col. 3).

This aspect of alcohol formation is again stressed when the specifier says that "the concentrations . . . are not only adjusted in such a manner that they become favourable to the propagation of yeast, but they are also at the same time adjusted in such a manner that they furthermore give a quite appreciable formation of alcohol so that the alcohol may either be caused to disappear again slowly during the process, or may be caused to remain, wholly or partially, as desired" (col. 4).

These two references, when considered together, require the interpretation that "even quite considerable" or "quite appreciable" amounts of alcohol will be produced at some stage of the process. In other words, although yeast is the principal product with which the manufacturer is concerned, the process will or may be carried out in order that there will be alcohol production to the extent indicated. According to the inventor, the manufacturer, if he desired to obtain yeast only, may complete the process so that the alcohol will disappear. But he also possesses the alternative of regulating the process so as to capture the alcohol produced in the course of yeast manufacture.

The inventor sums up the features of his process by declaring that it "forms a kind of regulator for a formation and conversion of alcohol going on co-ordinarily with the attainment of high yields of the best yeast" (col. 4). This statement emphases the point elsewhere made that, although high yields of the best yeast are obtained, there has been in the process formation of alcohol to an appreciable or substantial extent, which alcohol in the normal operation of the process will be converted so as to be utilised or assimilated by the yeast; but the statement is also in direct line with the earlier representation and promise that the alcohol so formed may, if so desired, be retained and captured by the yeast manufacturer at the end of the process.

Mr. *Bonney* argued that the express mention "that under the old process you lost the alcohol if you sought to avoid retardation,

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clearly leads one to expect that under Sak's process, you can get the yeast without losing the alcohol."

This argument is based upon the statements in col. 2, where it is said that " the retarding action of alcohol on the yeast formation is especially prominent in the skim-yeast (Vienna yeast) method. In the air-grown yeast method, it has been attempted to remedy this drawback, viz., the alcohol's retardation of the formation of yeast, by selecting suitably weak solutions, in which the alcohol formed could not materially injure the propagation of yeast. This process, however, has for effect that the alcohol produced will be lost, as it will not be feasible, in practice, to recover the alcohol when diluted beyond a certain limit."

The meaning of this statement is that, in the aerated method of yeast manufacture, such weak solutions are employed that, although yeast growth is not detrimentally affected, such alcohol as is produced will be irrecoverable. But this does not mean that the Sak process promises that, at the end of his process, there will be (1) a maximum production of yeast, and (2) at the same time the production and capture of alcohol in commercial quantities. The statement in the specification means that, instead of " suitably weak " solutions, stronger solutions may be used, so that (1) the alcohol produced will not be negligible but considerable, and (2) if, having regard to the state of the market (col. 5), it is desired that the alcohol produced in the process should be retained, that may be done.

It was also argued that the process promises a yield of yeast " of about 60 per cent or more," *together with* alcohol in considerable and recoverable quantities if desired. I am quite satisfied, having regard to the whole of the evidence and the authorities, and to the information afforded to me by the expert assessors, that the specification is not to be so construed.

The reference in col. 4 is that " the yeast thus produced, while quite considerable quantities of alcohol are present, appears in quantities corresponding to a yield of about 60 per cent or more." This means that the process, when carried out to its normal conclusion (i.e., in the maximal production of yeast), so that there is no desire to obtain alcohol at the end of the process, will give the percentage mentioned. It is obvious from the scientific facts that,

where little or no alcohol is produced, a higher percentage of yeast is obtainable than where a substantial or considerable production of alcohol has to be obtained. Therefore the objector has to maintain that the " about 60 per cent or more " is a reference to the *minimum* production of yeast. In my opinion it is a reference to the outstanding feature of the invention—that yeast production under the process *may* reach the previously unheard-of percentage of " about 60 per cent or more " notwithstanding the fact that, in the course of the process, " quite considerable " quantities of alcohol have been produced. Such an assertion was quite revolutionary, having regard to the state of the art. It is unreasonable to suppose that a scientific impossibility was also being suggested.

In the specification, two examples of the process are furnished. Example I. indicates that yeast is added to washing water of a strength of 1.5 to 2.5 degrees Balling, while the stronger mixture at 10 degrees Balling is set aside in a special receptacle so as to be added at later stages to the weaker mixture. After two or three hours' aeration, the more concentrated wort is added " preferably continuously " during intense aeration over a period of ten to eleven hours. The process is described, and it is said there will be produced " quite unusually large quantities of yeast " (col. 5).

I regard example I. as concluding at line 10 of col. 5, because in line 12 the specifier refers to " the above example."

It is asserted that, during a fermentation carried out in accordance with example I., alcohol will be produced in quantities " which may amount to 20 per cent or more of the raw material corresponding to the quantity of wort present in the fermentation vat " (col. 5). He also says that " in fermentations as those here referred to, the alcohol will be present or may be present in a concentration enabling it to be recovered commercially " (col. 5).

In my opinion, this reference to the quantity of alcohol which will or may be produced explains the other references in the specification to " quite considerable quantities of alcohol " and " quite appreciable formation of alcohol." A dispute arises as to what the 20 per cent is intended to refer to, whether it invites a comparison with the original raw material itself or with the dextrose derived from such raw material and so represented in the fermentation vat,

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or with some other standard of comparison. The question is referred to elsewhere. The further statement that alcohol " will be present or may be present " in a sufficient concentration to permit of commercial recovery, is no more than a repetition of the earlier statement that, if it is desired to capture alcohol, the process may be side-tracked for that purpose, whilst yeast production will also ensue.

In my opinion, the reference to alcohol recovery does not mean that the inventor suggests that at any given time or place, or at any time, such recovery " commercially " will necessarily be economically profitable. All he says is that the concentration of alcohol will be sufficient to permit of recovery for commercial purposes. The concentration he points to is, I think, that already indicated, viz., a concentration which may have amounted " to 20% or more " at some stage of the process.

The outstanding clue to the relation between alcohol and yeast production under the process is to be found in the statement that " the present process thus allows the manufacture to be adjusted according to the varying state of the market for yeast and alcohol " (col. 5). This clearly implies that the process should not be regarded as giving at one and the same time the *maximum* production *both* of yeast and alcohol. In the sentence quoted the reverse is plainly indicated. If it is unprofitable to use the process for alcohol recovery, such recovery should not be attempted, notwithstanding the fact that alcohol is being produced in sufficient quantities to allow of recovery in commercial quantities. If, however, in relation to alcohol the yeast market becomes relatively unprofitable, the process can be used so as also to produce both alcohol and yeast, the latter in lesser quantities than otherwise.

Example II. differs from example I. in that the wort into which the yeast is sown is at 1.7 degrees Balling, and the stronger wort which is set aside for future service of the yeast is at 7.1 degrees Balling. It is unnecessary to refer to example II. in detail, but it shows clearly in col. III. of the table that at a comparatively early stage of the process the amount of alcohol contained in the wort amounts to 87 kilogrammes of pure alcohol, and that, as the process goes on, this quantity decreases, until at the end, only 4 kilogrammes are present. Example II. may therefore be regarded as a case

within the specification where " considerable " or " appreciable " quantities of alcohol have been produced, but have subsequently disappeared, presumably either by assimilation on the part of the yeast, or utilization in some other way.

There is also a discrepancy in example II. between the table in col. 7 and the reference to three and a half hours in col. 6. This discrepancy is unimportant because it is generally agreed that the text should yield to the table, and, in any event, substantially the same ultimate results are obtained if the text itself is followed.

The Claims.

The claims are all summed up or built upon claim 1. Firstly, it claims a process for yeast manufacture " in which in accordance with the so-called differential management of the fermentation, a nutritive substance concentration suitable for the formation of yeast is maintained in the wort or mash during the run of the fermentation, while, by the addition of the necessary quantities of wort or mash of higher concentration, any variations in the concentration of the nutritive liquid due to the general vital activity of the yeast are equalized or compensated " (col. 8).

Particulars 6, 7 *and* 8—*Ambiguity.*

This part of the claim is said to contain ambiguities. In my opinion, the contention is not made out. The " differential management " is adequately and sufficiently described in several places of the specification, both in general terms and by particular instances. Emphasis is also laid upon the uncertain meaning of the " necessary " quantities of more concentrated wort. But the application of the phrase is not uncertain, because it refers to such quantities of more concentrated wort as will from time to time balance the loss of the nutritive substances owing to the demands of the ever-increasing colony of yeast cells.

Secondly, having described the differential process accurately in claim 1, the specifier then goes on to limit his claim to such a use of the process as will result in the formation of alcohol " in considerable quantities." It is also suggested that this is an ambiguous reference. Having regard to the indications elsewhere given in the specification, the specifier has already, as I have pointed out, indicated what he means by " considerable " formations of alcohol. It is such a

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quantity as will be sufficiently concentrated to permit of commercial recovery, there being a further indication in the figure " 20% or more " as to what precise quantity is regarded as satisfying this description to the maximum extent.

The third part of claim 1 contains a limitation by way of the further description that the alcohol formed to the extent indicated " is either recovered or assimilated by the yeast, but only during the subsequent period of the fermentation." It is also said that this period is not precisely ascertained. In my opinion, it is clear that the claim, read in the light of the specification, indicates definitely that, alcohol having been formed to the extent mentioned, the process is not then terminated but continued for such a time as is indicated for instance in the table of example II., where it is stated that " the run of the fermentation process is seen clearly and distinctly from the following table " (col. 7). The table indicates that, at 10 a.m., the process will have resulted in the production of 87 kilogrammes of pure alcohol. It also indicates that thereafter the process is continued for a period of eleven hours. This is made sufficiently plain elsewhere. Example I., for instance, states that the hot and more concentrated wort is added over a period of ten to eleven hours (cols. 4, 5). The " subsequent period " referred to in claim 1, therefore, means such a period as will enable the alcohol to be " recovered " or " assimilated by the yeast."

Particular 8 of the objections to claim 1 on the ground of ambiguity is therefore not sustained. With ground 8 there may also be considered grounds 6 and 7. Ground 6 is that the specification and claims do not adequately define the extent of the monopoly, and ground 7 that they do not give sufficient information to enable the public to ascertain the scope and ambit of the claims. In my view, the analysis both of the specification and of claim 1 which has been attempted, shows that the monopoly claimed is sufficiently defined so that persons reasonably conversant with the trade and art in 1919 would understand the area which is forbidden.

One difficulty which is said to be contained in claim 1 is the assertion that the alcohol produced, if its recovery is not sought by the manufacturer, will be " assimilated " by the yeast. No specific

objection is raised in the particulars that the asserted fact of assimilation of alcohol cannot be proved or known.

On the hearing, some evidence was directed to this question. I deal with the matter elsewhere, but I do not think that any specific finding upon it is actually required. Those to whom the specification was addressed could not fail to know that the process described in claim 1 was not intended to be, nor was it, in any way dependent upon whether the alcohol produced in the process, but not sought to be recovered, was " assimilated " by the yeast, or whether it was, as suggested in the specification, " utilized " by the yeast (col. 3). For all the practical purposes of the trade, it was immaterial whether the alcohol produced and stated to have subsequently disappeared from the vat, was acted upon by a catalytic agent, or was converted by an oxidising enzyme associated with the yeast into some of its simpler oxidation products with a consequent gain of energy to the yeast. In the circumstances, the assertion of the fact of actual assimilation was only of theoretical and of no practical importance in enabling the public concerned to ascertain the territory covered by the claims. " Assimilation " became, for all practical purposes, at once the antithesis of commercial recoverability, and the synonym for commercial irrecoverability, of alcohol.

This question of erroneous statement of theory is referred to in " *Z* " *Electric Lamp Manufacturing Co.* v. *Marples Leach & Co.* (1), where it was shown from knowledge gained after the date of the patent that the process of treating carbon filaments with certain phosphorous compounds did not remove all traces of carbon from the filament. But the specification had asserted that the process removed " even the last traces of carbon in the filament."

Fletcher Moulton L.J. said that the specification might justly be criticised from the point of view of abstract accuracy. He said that

> " carbon, as injurious carbon, is removed by the invention. Carbon from the chemical point of view is not removed. A lamp-maker at the date of the grant would naturally imagine that the whole of the carbon had been removed, because the deleterious consequences of the presence of carbon no longer existed, and that was the only way in which he was aware of the presence of carbon. That being so, I think that the erroneous view, from a chemical standpoint, was one into which a lamp-maker might naturally fall, and that it would not in the slightest degree diminish the completeness of the disclosure

(1) (1910) 27 R.P.C. 737.

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to the public of the invention, how to apply it, and what its practical consequences would be. Consequently I hold that, according to the English patent law, such an error is unimportant. The patentee's obligation is not to be *omniscient*; the patentee's obligation is to put the public in the possession of his invention, and if he does that bona fide, in such a way that they know its advantages practically, and they can obtain those advantages practically, the fact that he has formed an erroneous view in theory of that which procures those advantages, or the state of things in which those advantages occur, does not, in my opinion, militate against him " (1).

This decision is important because the actual claim was :—" In the manufacture of incandescent electric lamp filaments *free from carbon*, the employment " of the phosphorous compounds to act on the raw filaments. In other words, the erroneous statement as to the complete expulsion of carbon from the filament was carried into the claim itself. In point of fact, the error was not known at the time of the patent, but was only ascertained subsequently. But the judgment holds that, although the error existed or was known to exist, even at the date of the patent, and although the error was carried into the very terms of the claim, this did not vitiate the patent if otherwise valid, so long as from a practical point of view the public concerned were fairly given possession of the invention.

Apart from the question specially referred to above, I see no difficulty in the definition of the monopoly found in the claim. On the contrary, I regard the description in claim 1, before alcohol is mentioned at all, as a very clear description of the differential process. It could hardly be bettered, because it explains what is enough to indicate to the trade the territory which is forbidden, and yet it does so in a sufficiently general way to render difficult the task of the proposing infringer.

In the case of *Watson, Laidlaw & Co. Ltd.* v. *Pott, Cassels and Williamson* (2) Lord *Shaw* said :—

" A patentee must not use language so vague as to enable him to secure a monopoly for more than his real invention, and so to invade the rights of free rivals. But, on the other hand, it is permissible to state the real invention in language of such generality as is essential to preserve it and to prevent those rivals from invading the rights of the patentee. In the present case, I think that the specification and claim complied with these principles and that the vagueness is not deceptive vagueness . . . but is only that generality which would secure (to the inventor) the substance of his idea. In the case

(1) (1910) 27 R.P.C., at p. 746. (2) (1911) 28 R.P.C. 565,

of *Simpson* v. *Holliday* (1) . . . a distinctly alternative form was adopted by the patentee in his description of his invention. It was proved that one of the alternatives was an impossible or inoperative alternative. Nor can I leave out of view, in regard to the criticism directed against the vagueness of this specification, that there is no evidence that any practical man, acquainted with that class of work, would fail, on account of the vagueness of language, to make a machine which would adopt and adapt the idea usefully and successfully " (2).

The reference to alcohol in claim 1 is, of course, a narrowing of the territory of the monopoly, and the question then becomes—reading claim 1 as a whole—whether the internal boundary brought into existence by the alcohol feature of the process is itself sufficiently defined. In my opinion, it is defined in such a way that a person in the trade—again I speak of 1919—would have it conveyed to him without obscurity that the process did not seek to avoid, but welcomed, the production of alcohol in recoverable quantities, so as to enable the manufacturer to adapt the process, in order to (1) produce yeast only in maximum quantities and no alcohol, or (2) produce yeast in substantial quantities and also commercially recoverable quantities of alcohol. I, therefore, reject particulars of objections Nos. 6, 7 and 8.

Particular 5—*Insufficiency.*

It is convenient now to turn to particular 5, which is directed to insufficiency of description and method of performance. Before considering the objections in order, I should refer to several of the leading cases.

As was pointed out by *Jessel* M.R. in *Otto* v. *Linford* (3), omissions in the description which would be obvious to the " skilled mechanic " in carrying out an invention, and which he would be able to deal with without the exercise of invention itself, do not invalidate a patent. He said :—

" In these matters, therefore, it is not for us to find out how not to do it; but the workman, when he finds that the drawing does not work exactly, sets himself at once to see how it ought to be done, and in practice, the thing never arises at all. . . . We have the usual evidence in this case. Engineers are called who say that a workman will find it out and put it right . . . there is not produced on the other side a workman who said he had ever tried to make the machine and could not . . . A specification for improvements

(1) (1866) L.R. 1 H.L. 315. (2) (1911) 28 R.P.C., at p. 580.
(3) (1882) 46 L.T. 35.

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in gas motor engines is addressed to gas motor engine makers and workers, and not to the public outside " (1).

In *Goddard* v. *Lyon* (2) the Lord Chanceller, Lord *Herschell*, said:

" Although it may have been a matter of experiment as to how high it was desirable to go with regard to the pressure, yet from the outset, as I read the evidence, those who made use of this apparatus understood it to be an apparatus for the use of steam at a considerable pressure, and so employed it, and, according to the evidence, very advantageously employed it."

In *British Thomson-Houston Co. Ltd.* v. *Corona Lamp Works Ltd.* (3), where the claim was for " an incandescent electric lamp having a filament of tungsten or other refractory metal of large diameter or cross-section, etc.," the argument was that, as " large " was a relative term, its inclusion both in the description and in the claim vitiated the patent. Lord *Haldane* said:—

" I do not think that in the specification before us it was intended to define, or that it is possible or necessary to define, the expression ' large ' as referring to any definite limits. All that was necessary was . . . to tell to the lamp-makers how to get as large an incandescent surface as they wanted for their particular purposes. He made plain to them in the specification that this was no longer impracticable, and that, if they would adopt his new process of manufacture, they would attain a valuable commercial result, the outcome of the scientific principle implied in the process " (4).

He added:—

" Patents for a new discovery which is of so far-reaching a character that its nature and principle can be conveyed in the shape of a specific set of instructions to manufacturers, are not very common, but there are well-known examples of them which illustrate how little in the case of a really pioneer invention the description of the means of giving effect to it need be expressed separately from that of the principle discovered. The new process of manufacture may be of so general a character that it can be carried out by numerous mechanical equivalents, none of which in themselves require further invention, but which will suggest themselves to practical men skilled in the subject " (5).

Lord *Haldane* further stated:—

" This is, in my opinion, no mere abstract principle, but a method or process of manufacture, capable of being at once put into operation by any experienced electric lamp-maker, with such adaptations as his commercial requirements and standards suggest. To put it into operation requires no new inventive capacity, and it would have been inconsistent with the generality and sweep of the explanation given to have inserted a definition of the word ' large,' otherwise than relatively to current practice. Such a definition, if attempted, would have limited unnecessarily the ground over the whole of which the new method was to be made operative. The principle and its working in practice need not be distinguished here in the fashion which is required when the discovery is of some merely particular and qualified kind " (6).

(1) (1882) 46 L.T., at pp. 40, 41.
(2) (1894) 11 R.P.C. 354, at p. 361.
(3) (1922) 39 R.P.C. 49.
(4) (1922) 39 R.P.C., at pp. 69, 70.
(5) (1922) 39 R.P.C., at p. 70.
(6) (1922) 39 R.P.C., at p. 71.

In my opinion, this decision is more analogous to the present case than is that of *Vidal Dyes Syndicate Ltd.* v. *Levinstein Ltd.* (1), where *Fletcher Moulton* L.J. emphasized the truism that the patentee's duty was to describe the nature of the invention so as to ensure that the monopoly extended no further than the invention made, and also to describe the method of performing the invention, so as to ensure that when the grant expires, the public may " be put in full possession of the way to carry out the invention " (2).

The particular objection of Lord *Moulton* was that, merely to say that an invention consisted in causing sulphur to react on diamido napthols described nothing at all, because, before the date of the patent, no knowledge existed of any such reaction, so that the description necessarily covered every possible kind of reaction, however produced, and was too vague. The same absence of common knowledge showed that the method of performing the alleged invention was nowhere indicated, there being a total absence of directions in the specification as to diamido napthols.

Such a case, though based on the same principle which is here to be applied, is not so analogous as *In re Jameson's Patent* (3), where the patentee stated, in reference to process of dehydrating peat by electricity, that in case of a stoppage in the circulation of the peat, it ceased to conduct electricity, and so cut off the current as soon as there was decomposition of the hydro-cellulose. In point of fact, the resistance was only increased. *Phillimore* L.J. said :—" As an absolute statement, this is incorrect, but it is not for any material purpose incorrect " (4). *Cozens-Hardy* M.R. pointed out that the main idea of the patentee was to decompose the hydro-cellulose in peat by means of what was called an electro-osmotic process, which accelerates the decomposition. In the course of the specification, it was said : " The voltage may vary within wide limits, but a voltage of about 200 has been found to be, on the whole, the most economical.'

Cozens-Hardy M.R. said:—

> " This, in truth, gives you no direction, for the current passing through depends upon another element, namely, resistance ; and, so far as the evidence goes, 200 is not in practice the most useful or the most economical " (5).

(1) (1912) 29 R.P.C. 245.
(2) (1912) 29 R.P.C., at p. 266.
(3) (1915) 32 R.P.C. 377.
(4) (1915) 32 R.P.C., at p. 390.
(5) (1915) 32 R.P.C., at p. 387.

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Phillimore L.J. said :—

"An experimenter who, with this last passage before him, found that he was adding appreciably to the heat of the peat, would see that he was misapplying in some way his electric current. . . . The counsel (for it is no more), to use 200 volts is sufficiently guarded by the counsel that you are not to use a current to produce heat. The course to be steered between these two is a matter of particular and practical application" (1).

And *Cozens-Hardy* M.R. stated that

"a patentee is bound to give intelligible directions, though not necessarily such as to exclude experiment as distinct from invention" (2).

Bearing in mind the principles, I turn to the objections in their order :

1.—The specification states that "even quite considerable quantities of alcohol may be present during fermentation" (col. 3). It is objected that no instructions are given as to how much may be present and in what stages, without detriment to the process. Now I have elsewhere stated my opinion that the specifier does sufficiently indicate what he regards as "considerable" quantities of alcohol. He also makes it clear that the presence of alcohol in such quantities is *not* detrimental to the process, but that even where yeast alone is being aimed at, and no attempt is being made to capture the alcohol produced, yeast production is not hindered, but rather helped by the presence of alcohol (See col. 4). In my view (and this finding is bound up with the evidence I accept as to the prior act) sufficient instructions are given as to the quantities of alcohol which may, and should be, expected from a carrying out of the process.

2.—The specification also states that the process "should" be carried out "in such manner that such quantities of alcohol are formed and are present during the fermentation, but also so that the alcohol is not utilised by the yeast until during the further run of the fermentation, the alcohol being utilised or assimilated" (col. 3). The contention is that this direction gives no instructions as to what quantities of alcohol should be formed, nor by what means the proper quantities and no more should be formed,

"nor what are the proper quantities to be formed during the various stages of the fermentation, nor how such proper quantities may be formed or an excess or insufficiency avoided, nor as to the means whereby alcohol is not utilised

(1) (1915) 32 R.P.C., at p. 391. (2) (1915) 32 R.P.C., at p. 388.

by the yeast until during the further run of the fermentation, nor as to the means whereby the alcohol is utilised or assimilated during the further run of the fermentation, nor as to what stage of the fermentation it is intended by the expression 'the further run of the fermentation.'"

This objection should also be overruled. As I have already pointed out, the quantity of alcohol mentioned in the phrase "which *may* amount to 20% or more of the raw material" (col. 5) indicates that somewhere around this figure will be the *maximum* quantity of alcohol which can conveniently be produced. If so, the quantity is sufficiently indicated. The suggested lack of instructions as to the quantity formed during the various *stages* of the fermentations is, I think, a refinement of criticism. The yeast-maker wants to know how much alcohol will be made available to him at the *end* of the process if he decides to recover alcohol as well as yeast. He has provided for him, in example II., and the table thereto annexed, a very elaborate indication of what will happen if alcohol is *not* required and yeast only is required. Except for checking purposes, details are not required of yeast and alcohol production at each point in the process.

The argument that the maker is not informed as to how to prevent the alcohol from being utilized until during the further run of the fermentation, depends upon a special objection dealt with below—that there is no instruction how the amount of alcohol at the end of the process may be varied, as stated elsewhere in the specification. Further, the yeastmaker is not required to know the precise chemical changes involved, either in utilization or assimilation, for he has already been told, that whatever they involve, those changes will occur if the process is carried out along the lines of example II. Finally, the expression "the further run of the fermentation" refers to the period of ten or eleven hours between the first addition of the more concentrated wort and the end of the process.

3.—It is next argued that no instructions are given as to how "an easily obtainable approximate compensation or equalization" is obtained. Again, I think that instructions are given both as to the general principle and the standard or normal method of the process. That method is the maintenance of concentration of nutrient substance in the fermenting wort. There are many ways in which this method may be employed. Varying factory conditions

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have to be taken into account, and non-inventive experimentation will, no doubt, be found desirable. Examples I. and II. show in detail two methods of carrying out the process. In my opinion, there is no ground for holding that no instructions are given by the specifier as to how his principle or method is carried into effect.

4.—Selecting the passage in the specification in which it is stated that the concentrations are adjusted in such a way as to (*a*) favour the production of yeast, and also (*b*) produce quite appreciable quantities of alcohol, the latter disappearing slowly during the process, or remaining throughout it in whole or in part—counsel argues that there is no instruction as to what concentration during the fermentation is favourable to yeast production.

This argument misunderstands the main purpose of the invention, which is to maintain concentration throughout the process, so as to balance the consumption of nutrient substance against the growing needs and activities of the yeast colony. This may obviously be done in a very large number of ways, two of which are particularized. No doubt experience may be desirable or necessary in the circumstances of the particular factory or plant. But the general direction is that, though the degree of concentration may vary within certain limits, some concentration should be maintained. The complaint that no instruction is given as to how the process is to be adjusted, first of all, to produce alcohol, secondly, to cause it to be retained or to disappear as desired, is dealt with below.

5.—With reference to the statement in the specification that the process acts as a "kind of regulator for a formation and conversion of alcohol going on co-ordinarily with the attainment of high yields of the best yeast," it is contended that no indication is given how to obtain such regulator effect. This objection is answered by pointing out that the specification claims that high yields of yeast may be obtained in the aeration method without fixing so low a concentration as to reduce alcohol production to a bare minimum. The phrase criticized then (1) describes how under this new method alcohol will be formed in substantial quantities, and (2) says that it may be (*a*) retained for use, or (*b*) converted and utilized in the process of yeast production only.

6.—It is said of example I. that the temperature of the "hot" concentrated wort which is set aside in a reservoir is not given. This is an unjustified criticism. The temperature of the wort, when put in the reservoir, is stated as from 70 to 75 degrees centigrade, or as up to the sterilization temperature of about 70 degrees centigrade. No difficulty in the direction would be found in practice by a person conversant with the trade.

7.—It is objected that no instruction is given in relation to the comment upon example I., that the alcohol will, or may, be present in a concentration which permits of commercial recovery, as to how the process is to be controlled. This point is also dealt with in the next objection.

8.—It is objected that the instruction "By a slight variation of the temperature, the aeration, or the manner in which the wort is added, the amount of alcohol present at the end of the process may be varied" (col. 5) is not sufficiently definite as to any of the variants referred to.

In my opinion, the evidence established that at the time of the grant, the general effect of the three variations was known to yeast producers in Australia. Within certain known limits, the quantity of alcohol is increased by adding concentrated wort, if the process is started on a relatively low Balling. Within certain known limits, an increase in aeration will stimulate yeast production but retard alcohol production, whereas a decrease in aeration will produce the reverse effect. The effect of variations in temperature was also known to those expert in the art. The interrelation of these variants is discussed in authorities such as *Kiby, Delbruck and Hayduck*, and *Allen*. Professor Young was cross-examined about these factors. He certainly stated that the paragraph mentioned above does not, in itself, give instructions. The paragraph, indeed, makes a call upon the knowledge and practical skill of persons versed in the trade. Mr. *Bonney*, in a very careful cross-examination, was successful in inducing Professor Young to say that the precise result of the three factors mentioned—factors which are necessarily interrelated—"would be a matter for experiment." The witness also pointed out that in example I., as distinct from example II., a much higher percentage of alcohol was obtained, so that a guide as

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to the initial stages of the process dealing with the relative concentration of the weaker and stronger wort is obtainable from the figures given in these examples. In the main, however, Professor Young stated, with reference to this much criticized paragraph, " that is a matter I could only answer by experiment."

Mr. Walter, who was employed as chemist in one of the two Australian factories engaged in 1919 in yeast manufacture, was quite aware of the importance of aeration and temperature upon the activity of the yeast cell. It may, of course, be conceded that the trade was not acquainted with the precise effect obtainable by adding the more concentrated to the weaker wort (i.e., enormously increasing the yield of yeast). This fact, of course, is a feature of the patentee's case on subject matter. But the specification indicates quite clearly that alcohol production is affected by the three elements mentioned. The statement is quite correct, and all that can be said by way of criticism is that the specification affords no absolute or precise measure of the interrelation of the three variable factors upon alcohol production. It was, as Professor Young said, a matter of experiment in any given case to ascertain in the light of factory requirements what precise results would be obtained. But this only brings the case within the principles of the authorities already quoted. Whatever " experiment " was required demanded no further inventive faculty, but only practical factory tests, and the careful recording of results for the purpose of repetition and variation as desired. I am satisfied that the effect upon alcohol production of the three factors, in the state of knowledge existing in 1919, as added to by the specification itself, was sufficiently known to the yeast producer to enable him to carry through to a successful conclusion any experiments found necessary.

9.—It is objected that no instructions are given as to when it is advantageous, as the patentee suggests, to " sow a very liberal quantity of mother yeast or seed yeast." This criticism is also unjustified. The statement indicates that the high quantity of seed yeast may be sown " frequently." Within the principles he lays down the patentee is not required to exclude factory research and experiment.

10.—It is complained that no instruction is given as to how the directions in example II. should be varied if it is desired to obtain a commercial quantity of alcohol. This objection rather misunderstands example II. The table to the example indicates that the capture of alcohol is not an object being pursued in such example. The reason is not far to seek, because the concentrated wort is at 7.1 degrees Balling, and the first wort to which it is applied is on 1.7 degrees Balling. In example I., on the other hand, the concentrated wort is assumed to be at 10 degrees Balling, although its "concentration may vary between wide limits." Example II. is, therefore, an illustration of the normal application of the process when attention is directed to yeast production and yeast production alone. None the less, as appears from the table in example II., a substantial quantity of alcohol has been produced at a certain stage of the process. At one stage, after 409 kilograms of dextrose has been added, 87 kilograms of pure alcohol has been obtained. The percentage by weight of the raw materials at that stage was 14.9 per cent, and if it was decided even then to deflect the process in such a way as to capture as much alcohol as possible, by adjustment of temperature and aeration, commercially recoverable quantities of alcohol would have been available at the expense of reducing the yield of yeast.

11.—It is also complained that no instructions are given as to how to apply the invention to the skim yeast method. This is true in the sense that no *specific* instructions are given, but the patentee claims that the principle of his process is applicable to Vienna yeast. It must be remembered that in Australia at the relevant time, 1919, the method had gone out of use in commercial production. In the circumstances, he was entitled to claim that the principle of the differential process was also applicable to the Vienna method, and that, if necessary, by factory trial and experiment, the quantity of alcohol produced could be varied by adjusting the three factors already mentioned.

I conclude that ground 5 of the particulars, which alleges insufficiency in various ways, has not been made out.

Documentary Anticipation.

1.—*Lake:* Lake's specification is relied upon as a sufficient paper anticipation of Sak. Lake related, however, to the manufacture of yeast "without the ordinary alcoholic fermentation."

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In the course of his specification, Lake stated that the growth of the yeast would be completed within from six to eight hours after a sufficient addition of dextrose maltose, or other material "according to the density of the propagating liquid used, the temperature of the latter, and the amount of ozone in the air." He then says that, when the entire amount of the dextrose or other sugar has been consumed after from six to eight hours, a further quantity thereof, say from one-twentieth to one-tenth per cent is added. And he adds:—"The peptones may also, after having been consumed, be added in portions, or may be allowed to flow in gradually and continuously. The same propagating liquid made by successive replacements of the matter consumed remains in use for weeks or months, unless it is rendered impure." It should be mentioned that one of the improvements insisted on by Lake is the employment of vegetable peptones, with the addition of *slight* quantities of hydro-carbon (carbo-hydrates) for the purpose of yeast production. He stated that his improvement also consists "in adding successively peptones and sugar to the comparatively stable nutritious solution used for growing the yeast, and successively withdrawing the finished yeast produced in the same."

The peptones constitute the nitrogenous nutriment for the yeast, so that Lake has limited his proposal to making additions of nitrogen compounds and has not expressly mentioned the hydro-carbons at all. Even in relation to nitrogen, he does not suggest the maintenance of uniform concentration. Regarded *as a whole*, in comparison to Sak *as a whole*, Lake is very far distant indeed. According to Mr. Walter, the normal operation of the Lake process, insisting as it does on absence of alcohol, would take a very considerable time, possibly a week. The evidence of all the witnesses makes it clear that Lake does not lead directly to the subject patent.

As was said by Judge *Soper* in *Standard Brands (Inc.)* v. *Federal Yeast Corporation* (1) in reference to Rayner's patent (which corresponds to Lake's), "it does not appear that the ratio between the materials remains constant throughout the propagation of the yeast. Nor does Rayner show that there is any particular virtue in the

(1) (1930) 38 Federal Reporter (2nd S.) 314, at p. 334.

continuous addition of the nutritive material, as consumed, rather than the replacement of it at intervals, when consumed." And, further, " it does not seem possible to conclude either from the first or the second example, or from both together, that the patentee had discovered that either a continuous addition of materials or a relative constancy of concentration was particularly desirable. The main admonition of the patent was that the operator should not at any time add so much sugar that the alcohol produced could not be consumed by the yeast."

2.—*Thompson :* Thompson's specification was directed to the manufacture of pure yeast produced from dried lees of wine so as to produce non-poisonous alcohol, and avoid the production of such deleterious substances as furfurol. He states that when the microscope indicates that a pure and wholesome elliptic ferment has been obtained, there is added to the mother solution " in fermentation and in small quantities at intervals, wort " which has been suitably prepared. He also says that the addition of wort " must be effected rationally so as not to allow it to slacken."

Thompson's document is very far removed from Sak's. The quantities to be added, the intervals which are to elapse, the relation of the quantities to the concentration of the liquid in the fermenting vat, the principle of uniformity—none of these things are mentioned or even hinted at. In truth, Thompson was not concerned with the differential management of the fermentation at all. It is clearly not an anticipation.

3.—*Vignier :* This is the third paper anticipation relied upon. It related to a new system of fermentation of wines, wash or beer, and the making of yeast for the distillers in such a way that the must or wort was supplied " in fractional divisions to the fermenting vat or vessel." He also specified apparatus for supplying the wort in fractional divisions which were allowed automatically to pass at recurring periods from the must charger or reservoir to the fermenting vessel. He said that " this fractional division of the must is intended to gradually feed the yeast, which rapidly converts every discharge of said must to alcohol ; hence the saving of time in obtaining a wine at the higher alcoholic strength with an appropriate yeast."

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This specification does not suggest, much less require, the Sak process. As has been said of it in relation to a patent indistinguishable from that of Sak, "the patent involves a certain regulation of food supply, and it may be assumed that a similar procedure might be applied in the manufacture of yeast. But the only dilution of the initial wort is that caused by the conversion of the material into alcohol; the process is discontinuous, and there is no attempt at constancy of concentration" (1).

I, therefore, reject each of the three paper anticipations upon which the petitioner based this part of his case.

Subject Matter, etc.

There is not the slightest doubt that in the relevant territory —the Commonwealth of Australia—a very great step in advance of previous knowledge was taken by the differential process as embodied in Sak's invention. Before the Sak process, the characteristic of the curve showing the relation between the concentration of nutrient substance and the lapse of time under the aerated method process, was the steady fall of the former—the Balling decreasing throughout the process. In relation to the aeration process, in particular, it was believed that yeast growth would be very detrimentally affected unless the method in common use was adhered to. It was Sak who appreciated for the first time the significance of maintaining uniform or approximately uniform concentration of the nutrient substance required for the propagation of the yeast. His invention possessed both novelty and very great utility. The witness upon whom the petitioner chiefly relied, Mr. Walter, admitted that the percentage of yeast yield obtained from the application of the Sak process was 75 per cent as opposed to something in the neighbourhood of 20 per cent under the previously existing Australian method of manufacture. He stated that this result was "almost unbelievable." Even outside Australia the percentage yield of yeast prior to the introduction of the differential process did not exceed about 30 per cent.

It is, of course, true that the principle involved in the Sak process appears both simple and logical, now that everybody in the trade knows of it. By comparison, however, with previous knowledge and

(1) (1930) 38 Federal Reporter (2nd S.), at p. 336.

practice, it is impossible to over-estimate the importance of the discovery. His process swept aside all previous notions upon the subject, invoked an entirely new principle, and proceeded to embody it in a new method of manufacture. Not only did he not seek to avoid alcohol production, but, within limits, elsewhere referred to and discussed, his process encouraged such a production of alcohol as enabled the yeast-maker, if and when the exigencies of the market demanded it, to sacrifice a very high yield of yeast production, and get in place thereof a substantial yield of yeast, *together with* the capture of alcohol in commercial quantities. It is plain that particulars of objections 3 and 4, and particular 2, so far as it has not been dealt with under the heading, "Anticipation," should be overruled.

General Observations.

There are some additional observations which I wish to make. In order to deal with the technical aspect of many of the questions, the parties have provided me with two very skilled assessors, and much of what I have said and am about to say is based upon their expert knowledge of scientific processes, and their opinion and explanation of the results of the experiments actually carried out during the course of the case.

1.—The promise of the patentee that a yield of yeast of about 60 per cent or more is obtained from Sak's differential process, is clearly established; all the experiments justify this promise.

2.—It has to be remembered that the manufacture of yeast was and is a special kind of industry. Those engaged in its practice were persons from whom there must be expected such technical knowledge as would be possessed by properly trained brewing chemists. Indeed, this was pointed out in one of its aspects by the patentee himself, when he stated his expectation that his process would involve higher supervision costs (col. 4). Therefore the art to be considered in applying legal principles to this case is specialized and technical in character. I am of opinion that the effect on alcohol production of alterations in temperature, in aeration and in strengthening or weakening the brews, was known to those reasonably skilled in the art in 1919. I am not satisfied, however, that Mr. Walter should necessarily be regarded as typical of those then properly skilled in

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the art; at that time his training and experience were not such as might fairly be expected of a skilled brewing chemist in charge of such a complicated process.

3.—In his evidence, Mr. Walter laid very great emphasis upon the significance of pH as applied to the control of the Sak fermentation process. Now pH is merely a method of expressing in a scientific or technical manner effective acidity or hydrogen-ion concentration. It is quite true that since 1919 there has been an extension of the use of pH measuring instruments, which for many purposes are far more significant than "titratable acidity." pH measurement involves a greater possibility of refinement in control. Yet it is quite absurd to attribute the great increase in yeast yield from the successful application of Sak's process merely to the pH measuring instruments and the maintenance of pH in the fermenting vat. The specification itself requires additions of ammonia and ammonium sulphate, but it shocked Walter that any person should even think of putting ammonia, a powerful base, into the fermenting yeast. It "seemed like murder" to him, because acidity would be immediately destroyed or corrected. He could not reconcile himself to its insertion in a brew containing "live" organisms; it was too "drastic." Although the addition of ammonia water was specified, Walter decided that he "would put himself above the inventor and drop the process altogether."

4.—In my opinion, a properly trained brewing chemist would, in 1919, understand the necessity for the additions of ammonia water and ammonium sulphate. They serve two purposes, both of which were well known before 1919. These purposes were, first, the addition of the nutritive salts, and, second, the control or balancing of the acidity (or pH of the wort). My view about Walter's then qualifications is supported by his attitude upon another matter. When he first attempted to perform the Sak process, the result was to give slime. This was undoubtedly due to some infection, owing to his *not* following the specification direction as to temperatures; and in evidence he did not seriously dispute that this was the reason. Before the visit from a Danish expert, ordinary precautions against infection seem to have been neglected by him.

5.—In 1919 it was also well known to all concerned that the recoverable yield of alcohol from a fermentation process—speaking generally—decreased as the yield of yeast increased. Speaking generally, also, the converse proposition applied. This is illustrated sufficiently by the experimental evidence submitted in this case, and the technical authorities make the matter abundantly clear.

6.—The main point upon which Mr. *Bonney* finally attacked the patent was in relation to the assertion by the specifier as to the possible yield of alcohol. Now there are five possible ways of expressing the yield of alcohol: (*a*) The alcoholic content of the wort expressed in kilograms; (*b*) the alcoholic content of the wort expressed in percentage by weight in the brew; (*c*) the percentage yield based on the equivalent amount of alcohol to sugar (dextrose) compared with the total sugar added up to any given point of the fermentation process; (*d*) the percentage yield based on the total soluble materials in the wort which has been obtained from the mashing process; and (*e*) the percentage yield calculated on the total weight of raw materials used to make the equivalent amount of wort in the fermenting vat, as at any stage of the process. Example II. given in the patent itself (col. 7) uses the first three ways of expressing alcohol yield. This practice was followed by Mauri Bros. & Thomson, Ltd., and by the assessors in reporting the results of their experiments for the purpose of comparison. On this basis of calculation six of the ten experiments referred to in evidence give over 20 per cent yield of sugar converted to alcohol at the end of the fermentation. But Sak's example (example II.) where the object is to obtain yeast only, gives only .6 per cent of alcohol at the end of the fermentation. All of the experiments give 20 per cent or over, as at some stage of the fermentation, even when calculated according to the fourth method (*d*) above, that is, on the soluble raw material corresponding to the quantity of wort present in the fermenter at any given time.

7.—But it is stated in col. 5 that during a fermentation as in example I., alcohol will be produced in quantities which may amount to 20 per cent or more of the raw material corresponding to the quantity of wort present in the fermentation vat. Now I am prepared to accept Mr. *Bonney's* argument that this percentage

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indicates the method of expression according to (*e*) above. On this basis example I., experiment 3 of Foster, gave an alcohol yield of 18.9 per cent of raw material at the end of 6 hours fermentation, and 17.2 per cent of the raw materials at the end of the process. In the latter case, there were 234 kilograms of alcohol at 2.15 per cent of concentration. It is clear that such a concentration (i.e., 2.15 per cent) could have been increased by adjustment of temperature aeration, and/or strength of wort. The result of a very slight increase would have been to obtain a yield *exceeding* 20 per cent even at the end of the fermentation. Capable brewers could easily have made the necessary alterations in the light of prior knowledge, plus the additional information furnished by the specification itself. A few practical experiments might have been necessary so as to assure results in actual production; but nothing more of inventive skill was required than Sak had furnished. For instance, Walter, in one experimental brew, obtained 27 per cent of alcohol when determining the most economical method of producing alcohol without yeast or with as little yeast as possible.

8.—It is quite plain, and I find, that alcohol may be recovered commercially, when it is present in a concentration exceeding 2 per cent. In experiments I. and III. of Foster (example I.) this percentage is exceeded. The promise of the specifier that alcohol will be present, or may be present, in a concentration enabling it to be recovered commercially, is clearly substantiated. The net result of the experiments of the assessors is to confirm the authenticity and general accuracy of those conducted by Mr. Foster. I am also satisfied that the statement in the specification that during a fermentation, as carried out in example I., alcohol will be produced in quantities which may amount to 20 per cent or more of the raw material, is also substantially correct.

9.—I reject the suggestion that, upon a fair reading of the specification, the patentee promises a yield of 60 per cent of yeast *and* 20 per cent of alcohol from the same fermentation. If the patentee had stated that such would be the result of his process, a declaration of invalidity would have to be made. But I am clearly of opinion that no reasonably well equipped person in the trade to which the specification was addressed, could have read the specification as

promising such an impossible result. Those skilled in the trade would have read the specification as promising 60 per cent yield of yeast when yeast alone was being sought, and as understanding the reference to 20 per cent production of alcohol as being limited to the case where, in the market situation, the need for such a high yeast yield no longer existed. Even in the latter case, a good yield of yeast is obtained—as the experiments show—when comparison is made with the previous existing capacity of yeast production in the Commonwealth. For instance, Walter knew that the degree of aeration could be controlled so as to decrease yeast (and increase alcohol) or increase yeast (and decrease alcohol). He knew, broadly speaking, that high yields of yeast *could not* be obtained concurrently with the 20 per cent production of alcohol. Walter's evidence was :—

> Mr. *Flannery* : " Your view, I take it, that you expressed to Mr. *Bonney*, was that in a brew of this description, the description which is indicated in example II., no alcohol would be produced ? Correct.
>
> At any stage ? At any stage.
>
> And that no alcohol is utilized ever in the production of the yeast ? It is an indication of inefficiency if it is formed.
>
> If it is formed, it is an indication of inefficiency ? Yes.
>
> You mean if after formation it is left there ? If it is formed at all.
>
> You must get it, must you not ? No, not alcohol."
>
> Mr. *Flannery* : " He says that is so. That was the view that was at the bottom of certain of the processes—avoiding the production of alcohol and how to better the production of yeast ? Yes.
>
> That idea was there ? Naturally.
>
> That was the idea that was prevalent—I put this before this morning—before 1919 ? Yes.
>
> And it was the foundation of that practice which said, start with a very dilute solution and keep to it as far as you can ; is that right ? That is right.

Walter said that he understood Sak was boasting of a result at once impossible and inefficient. But I am of opinion that Sak's promise was not as Walter suggests.

10.—The tendency of some of the witnesses to reject the possibility of the " assimilation " of alcohol by the yeast is not easy to understand. It is quite true that the yeast would select the more easily assimilated sugars from the available raw materials, and that this selection would continue until towards the end of the fermentation. At that stage, however, a very large quantity of yeast was deprived of most of its " natural " foodstuff, i.e., sugars. Clearly the possibility

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of some alteration of the metabolic process of the yeast so as to enable it to make some use of the only substance left—alcohol—could be—and was—envisaged, even before 1919. There is very definite evidence, in the experiments where a high yield of yeast is obtained, that there is a marked decrease in the percentage concentration of alcohol towards the end of the fermentation. This fact must have been observed by Sak at the date of the patent (Table to example II.). The knowledge of the life process of yeast was, as it still is, far from complete. Sak's explanation of the observed disappearance of alcohol as having been caused by assimilation or utilization, was as reasonable as might be expected at the time. Even if the explanation of the facts was not accepted, the facts themselves could not be misunderstood by those competent in the art. In 1908 Trillat and Sauton had shown that bakers' yeast would convert part of a dilute alcohol into acetaldehyde. When bakers' compressed yeast was vigorously stirred with dilute alcohol (with aeration) there was obtained a conversion to acetaldehyde. The action involved is a vital one. Further acetaldehyde disappeared fairly rapidly when added to yeast in dilute alcohol. Since the year 1919 a number of investigators have confirmed the fact that yeast can in some way convert alcohol into other substances, such as acetic acid and carbon dioxide. It is unnecessary to elaborate this part of the case, but I am by no means satisfied with the somewhat lazy inclination to discard the possibility of assimilation of alcohol by yeast. Unfortunately nothing is so painful—even to some scientists—as a new idea. In the American decisions to which reference was made, there were claims involving the same hypothesis of assimilation of alcohol. It is worthy of note that, although their validity was tested in every possible way, the assertion or implication of assimilation was either accepted as true, or ignored as a mere theoretical error involving no possible misdirection to those skilled in the art.

11.—The only particular of objection specifically directed to the claim of false suggestion is particular 9. The complaint is the statement that the amount of alcohol at the end of the process may be controlled and varied. I am of opinion that the statement is not false, but true. In my opinion, within the ambit covered by

Sak's differential process, the known variables of temperature, aeration, and strength of concentration invited experimental adjustment of these variables to meet factory needs and market demands.

I cannot part with this case without acknowledging my indebtedness first to Dr. R. K. Murphy and Dr. V. M. Trikojus, whose assistance on the technical aspect of the case has considerably lightened my labour; and, second, without any disparagement of others, to Mr. *Bonney*, who, acting almost as *amicus curiae*, has placed at my disposal his expert and specialized knowledge of what its devotees now describe as patent "jurisprudence."

I dismiss the petition with costs.

From this decision the petitioner appealed to the Full Court.

Bonney K.C. (with him *Gain*), for the appellant. The patent is void on the grounds of want of subject matter, anticipation and ambiguity. The idea of maintaining uniformity of concentration in the fluid in which the yeast grows was known and made public by the antecedent specifications referred to in the particulars of objections. This specification represents that the process will produce a yield calculated on the raw material used, of about sixty per cent or more of yeast together with alcohol recoverable in commercial quantities. Representations to this effect are made in several places in the specification, and also in the claims. The fact, however, is that the process will not produce the yield of yeast and alcohol as represented. The process is put forward as one in which the production of alcohol in saleable quantities is a material element. The expression "raw material" as used in the representation means the raw material used for mashing measured by weight. The patent, therefore, is void because the process will not do what the patentee represents it will do (*Simpson* v. *Holliday* (1); *In re Alsop's Patent* (2); *Natural Colour Kinematograph Co. Ltd.* v. *Bioschemes Ltd.*; *Re G. A. Smith's Patent* (3); *Hatmaker* v. *Joseph Nathan & Co. Ltd.* (4); see also *Vidal Dyes Syndicate Ltd.* v. *Levinstein Ltd.* (5); *Kraft, Kraft Cheese Co. (Inc.) and Kraft Walker*

(1) (1866) L.R. 1 H.L. 315, at pp. 320-322.
(2) (1907) 24 R.P.C. 733, at pp. 752, 753.
(3) (1915) 32 R.P.C. 256.
(4) (1919) 36 R.P.C. 231, at p. 239.
(5) (1912) 29 R.P.C. 245, at pp. 271 272.

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Cheese Co. Pty. Ltd. v. *McAnulty* (1)). The claims of the specification do not specifically define the monopoly and are avoidably ambiguous; in particular, it is uncertain whether " the so-called differential method " applies only to the addition of wort or mash, or applies also to the addition of other nutrients; it is uncertain whether the claims cover or do not cover a substantial departure from a constant nutritive concentration throughout the process; the expression " whereby alcohol is formed in considerable quantities " is vague; the specification must be interpreted as it would be understood at the date of the patent, that is, 1919, by a person familiar with the art in Australia. The expression " considerable quantities " is capable of several different interpretations (*British Thomson-Houston Co. Ltd.* v. *Corona Lamp Works Ltd.* (2)); and to suggest that the words " which alcohol is either recovered or assimilated by the yeast " covers the disappearance of the alcohol whether it is assimilated or not, would be such a departure from the natural meaning of the word " assimilated " as would render the patent void for ambiguity. The legal principles by which this issue should be tested appear in *Ingersoll Sergeant Drill Co.* v. *Consolidated Pneumatic Tool Co. Ltd.* (3); *Natural Colour Kinematograph Co. Ltd.* v. *Bioschemes Ltd.*; *Re G. A. Smith's Patent* (4); *Re Erickson's Patent* (5); *Submarine Signal Co.* v. *Henry Hughes & Son Ltd.* (6); and *British Hartford-Fairmont Syndicate Ltd.* v. *Jackson Brothers (Knottingley) Ltd.* (7)).

[STARKE J. referred to *Cassel Gold Extracting Co. Ltd.* v. *Cyanide Gold Recovery Syndicate Ltd.* (8).]

The mass of definition in the claims is confusing; it is impossible to determine what is really meant. The patent is void because the specification is ambiguous, insufficient and inconsistent in the instructions which it gives as to (*a*) whether mineral nutrients are necessary or optional; (*b*) what quantities of alcohol should be formed during the process; (*c*) how the alcohol formed in " considerable quantities " can be either " assimilated " by the yeast, or

(1) (1931) 48 R.P.C. 536.
(2) (1922) 39 R.P.C. 49.
(3) (1907) 25 R.P.C. 61, at p. 83.
(4) (1915) 32 R.P.C., at pp. 266, 268.
(5) (1923) 40 R.P.C. 477, at p. 484.
(6) (1931) 49 R.P.C. 149, at p. 174.
(7) (1934) 51 R.P.C. 254, at pp. 260, 261.
(8) (1894) 11 R.P.C. 638; (1895) 12 R.P.C. 232.

"utilized" by the yeast, or "caused to disappear"; (*d*) whether equalizing of concentration should be applied only to wort or mash or should be applied to whatever nutritives are used; and (*e*) the extent to which uniformity of concentration of the nutritive substances vary or should be departed from during the process. The patent also is void because there is no subject matter for inventive step. If there was a known favourable concentration there is no invention in the idea of maintaining the favourable condition; that was obvious and had been disclosed by Lake, Vignier and Thompson. Further, there is no invention in the manner of giving effect to that idea, namely, adding fresh nutrient to replace that which is being used up; that is the obvious and only way of carrying out the idea (*British Celanese Ltd.* v. *Courtaulds Ltd.* (1)). The idea of uniformity and of adding strong to weak had already been disclosed by Lake, Vignier and Thompson; such disclosure was fatal to all that was said to constitute invention in the Sak process (*Pugh* v. *Riley Cycle Co. Ltd.* (2); *George Mann & Co. Ltd.* v. *Furnival & Co. Ltd.* (3)). In the course of his judgment the judge of first instance arrived at erroneous conclusions on a number of important matters. A patentee must sufficiently describe his invention, and where he puts forward a departure from previous knowledge he is less and less able to rely upon common knowledge to make up for the deficiencies in his specification (*Vidal Dyes Syndicate Ltd.* v. *Levinstein Ltd.* (4)). In *Standard Brands (Inc.)* v. *Federal Yeast Corporation* (5) the only aim was to produce yeast without alcohol.

Flannery K.C. (with him *W. J. V. Windeyer*), for the respondents. The onus of proving facts necessary to establish its case, is upon the appellant. If, for example, for the purpose of voiding the patent, the appellant relies upon the ground that it is doubtful whether alcohol is, as a scientific fact, assimilated in the process, it must prove to the satisfaction of this tribunal that there is no such thing as assimilation. If the matter is left in doubt, as it has been, the appellant must fail. Quite apart from the agreement between the parties that the judge of first instance should, if he so desired,

(1) (1933) 50 R.P.C. 63, at p. 113.
(2) (1914) 31 R.P.C. 266, at p. 276.
(3) (1914) 31 R.P.C. 349, at p. 360.
(4) (1912) 29 R.P.C., at pp. 268, 269.
(5) (1930) 38 Federal Reporter (2nd S.) 314.

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avail himself of the assistance of assessors, his Honour was entitled also to inform his mind by reference to books upon the subject (*Federal Commissioner of Taxation* v. *Clarke* (1); *London Bank of Australia Ltd.* v. *Kendall* (2); *Dearman* v. *Dearman* (3)).

[DIXON J. referred to *Schumacher Mill Furnishing Works Pty. Ltd.* v. *Smail* (4).]

An appeal court is at a disadvantage as compared with the judge of first instance, and, unless it is demonstrably wrong, his decision should not be disturbed (*s.s. Hontestroom* v. *s.s. Sagaporack* (5)). The specifier has provided his own dictionary for the purpose of interpreting the specification. Any person conversant with the production of yeast and alcohol recognizes that maxima are not obtained in conjunction. He knows from his ordinary knowledge of the industry that there can only be a maximum of one or the other at the one time. The judge's findings on questions of fact relating to the process are supported by the evidence. The prior state of the art is as set forth at the commencement of the specification. Difficulties previously experienced in the production of yeast from the presence of alcohol are overcome by the Sak process, that is, when the usual nutritive substances, e.g., mash and wort, are supplied to the yeast in an entirely different manner from that previously known. What is aimed at is a constant, mainly and essentially a constant of sugar, but also, incidentally and for better results, a constant of the other nutritives. Nitrogenous material sufficient, but not more than sufficient, to feed the yeast, must be maintained. The specification should be construed having regard to the state of knowledge possessed by those conversant with the art. So far as the aeration process is concerned, the Sak process is a reversal of that method. So far as the Vienna process is concerned, it is not a reversal but something in the nature of a complete change. The discovery by Sak was that alcohol does not do any harm in the formation of yeast as was thought previously, but, on the contrary, does good, and he provides a different method in order to produce this result. Mere simplicity of the idea cannot be a ground for voiding the patent. The presence of alcohol in

(1) (1927) 40 C.L.R. 246, at p. 262.
(2) (1920) 28 C.L.R. 401, at p. 408.
(3) (1908) 7 C.L.R. 549, at pp. 560, 561.
(4) (1916) 21 C.L.R. 149.
(5) (1927) A.C. 37, at pp. 47-49.

negligible quantities is what was aimed at and secured in the old method, aimed at theoretically and secured practically. The word " considerable " is used in this specification in contradistinction to that idea. Also " considerable " is measured with regard to the quantity of sugar available to be turned into alcohol. Tests prove that the specifier was justified in using the word " considerable." He cannot rightly be accused of vagueness. " Commercially " is used in regard to the quantities produced by this process, that is, on a large scale, as opposed to the infinitesimal quantities produced in a laboratory; it has nothing to do with profit-making. Under this process yeast can be produced in the presence of a considerable quantity of alcohol. When alcohol is the objective it is recoverable commercially. Experiments carried out for the purpose of this suit, evidence of which is before the Court, support the specifier's claim and justify the conclusions arrived at by *Evatt* J. that the percentages of alcohol are considerable, and that throughout alcohol is substantially 20 per cent of the raw material. In arriving at those conclusions his Honour had the advantage of consultation with assessors. " Considerable " in regard to alcohol as a final result, as opposed to alcohol being present during the run of the fermentation and disappearing in the later stages, must be considered in conjunction with the 20 per cent, and with " commercially recoverable." " 20 per cent " refers to the raw material and the manufacture of alcohol, not the mashing material. When the specifier wishes to refer to " mashing materials " he does so expressly. When he mentions the percentage of yeast he desires to obtain he refers to mashing materials. According to the evidence the invariable practice in the trade is to associate yeast production with the mashing materials, and alcohol production with the sugar. It was not wrong to assert assimilation (*Journal of Biological Chemistry*, vol. 62, p. 834; *Stephenson* on *Bacteriological Metabolism*, pp. 29, 31). The appellant has not discharged the onus of proving that the alcohol is not assimilated. The specifier used " assimilation " as a synonym for " utilization." In the same specification the word is used, apparently, as a description of what is observed, apart from theory, that it is caused to disappear. It is important that by following the examples given the experimenters obtained

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the results claimed by the specifier. The patent is not void for want of subject matter. The method that Sak used for the purpose of giving effect to his idea of maintaining the constant was new. An advance on previous knowledge was involved in the differential process as embodied in this process. It is a combination of idea and method. The findings of *Evatt* J. on this issue are correct. The information and directions given by the specifier are sufficiently specific. There is no evidence that before 1919 this process was ever attempted either deliberately or by accident. The " paper anticipations " were properly rejected by *Evatt* J. for the reasons stated by his Honour. The claim is restricted to the use of the differential method, that is to say, the method of compensation by the addition of strong to weak wort. That excludes what was referred to as the lagging period, and excludes also the later period where the fermentation is allowed to complete itself. The process is amenable and useful for securing alternative results. All that is meant in the claim is the practical application of the idea. It is restricted to particular practical application. The method is described sufficiently to indicate the limits to anyone acquainted with the subject. Results obtained without alcohol are outside the claim ; similarly, if neither yeast nor alcohol is obtained.

Bonney K.C., in reply. It is asserted that Sak discovered as a scientific fact that the presence in the wash of alcohol below, say, 4 per cent is not prejudicial as was thought formerly. The discovery of a scientific fact is no subject matter for a patent. It is not an invention however much it may be a discovery. There is no subject matter for the further reason that the Sak process constitutes an attempt to prevent people from using known conditions to their advantage. Sak, as his predecessors had done, added wort to wort. It was simply a matter of variation, that is, a working variation or direction which cannot, and should not, be made the subject of a patent (*Pugh* v. *Riley Cycle Co. Ltd.* (1) ; *Cincinatti Grinders (Inc.)* v. *B.S.A. Tools Ltd.* (2)). Subject matter is dealt with in *Terrell* on *Patents*, 7th ed. (1927), p. 47 ; see also *Hickton's Patent Syndicate* v. *Patents and Machine Improvements Co. Ltd.* (3). The assertion as to

(1) (1914) 31 R.P.C., at p. 282. (2) (1931) 48 R.P.C. 33.
(3) (1909) 26 R.P.C. 339, at p. 347.

"considerable quantities" affects the matter in three ways: (*a*) *qua* directions the expression is insufficient; (*b*) the promise of a 60 per cent yield of yeast and "considerable quantities" of alcohol cannot be sustained; and (*c*) the expression is ambiguous and vague. "Commercially recoverable" is recovery which comes fairly within the scope of profitable recovery in any particular country. The production of alcohol in relation to the original raw materials put in the mash is dealt with in *Molinari's Chemistry* (1921), p. 149; see also *Journal of Biological Chemistry*, vol. 62, pp. 823-836. There was no common knowledge concerning assimilation either as to how it could be achieved, or how it could be avoided; therefore the specification and claims are insufficient and ambiguous.

Cur. adv. vult.

The following written judgments were delivered:— 1935, July 15.

RICH J. This is an appeal from a judgment of *Evatt* J. dismissing a petition for the revocation of letters patent granted to the first-named respondent. The invention which is the subject of the patent was made in Denmark by one Soren Sak. It relates to the manufacture of yeast. Upon this appeal the grounds of attack upon the patent were confined to misrepresentation or failure of consideration, insufficiency and avoidable ambiguity and lack of subject matter. The specification is drawn upon the basis that the readers to whom it is addressed are thoroughly conversant with the technology of the industry. Owing to this fact the specification appears upon the first approach to present many difficulties, which progressively vanish with the reader's advance in the acquisition of knowledge of the relevant chemical and industrial information. The proceedings necessarily occupied some time before *Evatt* J., and in the course of them he obtained a complete mastery of the matter, as appears from the text of his judgment. His judgment naturally assumes in the reader some acquaintance with the subject matter. Availing himself of sec. 86 (8) of the *Patents Act* 1903-1933, his Honour with the consent of the parties called in the aid of assessors. The parties also consented that his Honour should be at liberty to use trade

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and technical writings as he should desire, and of this consent he freely availed himself.

Yeast is a single cell micro-organism which grows in a nutrient based upon proteins and carbo-hydrates. Sugar and nitrogen in appropriate chemical forms constitute its nutritives. In the process of yeast manufacture these are obtained from cereals. The grain is malted and mashed with the object of reducing the starch to soluble sugar form. When the mash has reached a suitable stage its contents are used for the propagation of yeast. At one time the seed yeast was directly sown into the mash in which it proliferated. This is the old Vienna method. For many years, however, the practice has been to filter off from the mash a liquor containing the nutrient substances. The mash is washed several times in order to secure from it as great an amount of the nutritive substances as may be. Each successive wash necessarily is weaker in nutrient quality. The liquor forms a wort in which the yeast is sown and propagates. The growth of the yeast is accompanied by or constitutes a fermentation and, by an intricate chemical process, from the carbon there is a large formation of alcohol. When, owing to exhaustion of the nutritives and retardation by the alcohol, the rate of the growth of yeast has diminished to such an extent that it is proper to stop the ferment, the yeast is taken from the wort by a mechanical process of separation. Before Sak's invention alcohol formed a capital difficulty for the yeast manufacturer. The production of alcohol during the growth of yeast was inevitable. But in the presence of alcohol the growth of yeast was slow and difficult. It was long ago discovered that yeast grew more quickly and with very much less nutrient under the influence of atmospheric oxygen. Indeed it was only by aerating the wort that it became practically possible to change from the Vienna method. In some degree aeration helped in the contest with alcohol. But the chief means adopted by the manufacturer was to use a weak wort. The weakness of this wort meant the dilution of the alcohol. Accordingly the practice was to sow the yeast in a wort which was not strong and to reduce its strength as the proliferation of the yeast continued by adding the weaker solutions obtained from the later washings of the mash. The process, in other words, involved a course of

progressive dilution of the wort with the progressive increase of the yeast cells. By means of instruments and tables the percentage of alcohol and the degree of concentration are readily ascertainable during the course of the process. As in brewing, so in yeast production the saccharometer is an essential appliance. In this state of affairs Sak discovered that the method adopted to deal with the alcohol was a mistake in the manufacture of yeast. He found that the greatest yeast production could be brought about by disregarding alcohol and seeking uniformity in the nutrient supply to the increasing yeast. For some reason which even yet has not been satisfactorily explained by bio-chemical science, if the multiplying yeast cells are provided with a nutrient of proportionate strength, while in the earlier stages the production of alcohol proceeds, in the later stages there is an answerable disappearance of alcohol. In the specification, after speaking of the Vienna method, which it calls the skim-yeast method, and the newer method, which it calls the air-grown method, the state of the art is described as follows:—"In both cases the yeast propagates in a mash or wort becoming, during the fermentation continuously poorer in nutritive substance, one of the reasons for this being the consumption of substance caused by the propagation of the yeast. In the air-grown yeast method the concentration of the nutritive liquid is reduced not solely on account of the consumption of substance due to the propagation of the yeast, but also on account of the nutritive solution being diluted by addition of washing water, which addition is continued during the entire washing process. In the said methods the individual yeast generations will develop under very different conditions of life, their development commencing in a nutritive liquid of high concentration, i.e. in a surplus of nutritive substance, while the last generations will develop under unfavourable conditions of life, i.e. in a weaker nutritive solution, where they will be wanting nutritive substance. Furthermore, the alcohol formed during the fermentation according to the above-mentioned methods of fermentation will have a retarding effect on the formation of yeast. The retarding action of alcohol on the yeast formation is especially prominent in the skim-yeast (Vienna-yeast) method. In the air-grown yeast method, it has been attempted to remedy this drawback, viz. the alcohol's retardation

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of the formation of yeast, by selecting suitably weak solutions, in which the alcohol formed could not materially injure the propagation of yeast. This process, however, has for effect that the alcohol produced will be lost, as it will not be feasible, in practice, to recover the alcohol when diluted beyond a certain limit. In spite of the attempts to remedy these drawbacks, there will always remain, by the said fermentation methods the main drawback that the yeast during its development must always work in a wort or mash becoming constantly poorer in nutritive substance, so that the last generation will have to fight against conditions of life which become constantly more unfavourable." Sak's invention consists in adopting an entirely new management of the concentration of the wort. From one point of view it may be said to be very simple, and it is from that point of view that the attack on subject matter is made. He takes a relatively weak or dilute wort, and, as the consumption of its nutrient content goes on, he replaces the loss by contributions of stronger wort containing greater nutrient substances. He describes this process in his specification metaphorically, as "differential management" of the concentrate—a figure which appears to assist the understanding of those who are mathematically inclined and confuse those who are not. The difficulty of the case really arises from the consequences which the invention involves in the production of alcohol. That production rises, and if the fermentation is stopped before the subsequent disappearance of alcohol the yeast may be taken from the wort and the liquid will contain sufficient alcohol to make it worth while distilling. Even when the fermentation is carried to what a yeast manufacturer would consider its completion, alcohol will remain, but not in quantities which in this country would be considered worth commercial distillation. It appears that yeast manufacturers are familiar with methods of providing more alcohol than yeast by the manipulation of concentration and temperature. The specification avails itself of these facts to suggest that alcohol may be obtained from the process. The attack on the patent is to a great degree founded upon the patentee's explanation of the disappearance of alcohol, the nature of his assertion that alcohol can be obtained and the sufficiency of the description of the manner of dealing with alcohol. The first

ground relied upon in support of the appeal before us was, as the learned counsel stated it in the course of his able argument: "The specification represents that the process will produce a yield, calculated on the raw materials used, of about 60 per cent or more of yeast together with a commercially recoverable quantity of alcohol, but in fact it will not do so." This ground raises a pure question of construction. The specification undoubtedly asserts that alcohol may be recovered when the process is used. It undoubtedly claims that by the means of the process a very high yield of yeast can be obtained. The question of construction is whether it claims that a high yield of yeast can be obtained and at the same time a considerable quantity of alcohol recovered. Subsidiary questions of construction attend the main question. For there is an issue upon the topic of the commercial recovery of alcohol. Owing to the local conditions in Australia, into which I need not enter, it is not profitable to distil from liquor containing a percentage of alcohol high enough to make a continental distiller eager to have it. Accordingly it is said on one side that, if the process is completed, commercial recovery is impossible, and on the other that there will always be enough alcohol for commercial recovery however far the process is carried, but that this does not mean profitable recovery in Australia under existing conditions. I am content to disregard this subsidiary controversy and to assume that, if the specification does assert that a large yield of yeast, e.g., 60 per cent can be obtained and at the same time alcohol can be recovered by distillation in commercial quantities, then the patentee's promise cannot be made good. On a fair construction I do not think that it makes such a promise. The passages relied upon by the appellant are set out in the written submissions which were handed up, and I do not wish to encumber this judgment by repeating them. They certainly contain language which, if read apart from context and subject matter, might be so understood. But with a closer acquaintance with the standpoint of the yeast manufacturer, who is necessarily technically equipped to a much higher degree than in most arts, the likelihood of so understanding the passages is much lessened when the whole specification is read. I think it clearly appears that the specifier is always presenting the recovery of alcohol as an alternative with the recovery

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of the larger yields of yeast. In his judgment *Evatt* J. has dealt with this matter fully, and in my opinion, quite satisfactorily. And I do not propose to repeat what he said. But it does appear to me that the passage in the specification in which the manufacturer is directed that he may vary the amount of alcohol present at the end of the process by a slight variation of temperature, aeration and the manner of adding wort is inconsistent with the meaning upon which the appellant relies. For it is followed by the statement: "The present process thus allows the manufacture to be adjusted according to the varying state of the market for yeast and alcohol." This presents a clear alternative—a choice to be exercised according to the price of yeast and the price of alcohol. In my opinion, the specification contains no misrepresentation.

The allegations that the specification is avoidably ambiguous and insufficient also depend in a great degree upon matters connected with alcohol and its subsequent disappearance. The claim upon which the patent must stand or fall is claim 1, which is expressed as follows: "Process for the manufacture of yeast, especially air-grown yeast in which, in accordance with the so-called differential management of the fermentation, a nutritive substance concentration suitable for the formation of yeast is maintained in the wort or mash during the run of the fermentation, while by the addition of the necessary quantities of wort or mash of higher concentration, any variations in the concentration of the nutritive liquid due to the general vital activity of the yeast are equalized or compensated, whereby alcohol is formed in considerable quantities, which alcohol is either recovered or assimilated by the yeast, but only during the subsequent period of the fermentation." At the conclusion of this claim it is asserted that alcohol is either recovered or assimilated by the yeast but only during the subsequent period of the fermentation. In the body of the specification the expression "utilized" by the yeast occurs. It is also said that the yeast may be either caused to disappear or caused to remain as desired. It is contended that no instructions or information are given as to how the alcohol is utilized, assimilated or caused to disappear. The fact is that it is extremely difficult to say what happens to the alcohol. It is quite clear that during the run of the fermentation the percentage

of alcohol rises to a comparatively high figure and then descends to a comparatively low figure. Some attention to the phenomenon has been given by Messrs. A. K. Balls and J. B. Brown, who deal with that and other matters in two papers contributed to the *Journal of Biological Chemistry* vol. 62, entitled "Studies in yeast metabolism." They sum up their conclusions towards the end of the second paper in the following paragraphs:—"In view of these experiments we feel that the actual loss of alcohol observed in our previous work, and the excessive production of carbon dioxide, are in part at least explained by the transformation of alcohol into carbon dioxide by yeast in the presence of air. The carbon dioxide found is by no means the equivalent of the alcohol used up, so that we believe other products, which we have not yet detected, are formed simultaneously. Whether the alcohol suffers a direct oxidation in the presence of the yeast, or whether a passage of the alcohol carbon through the cell materials takes place, resulting in its ultimate appearance as carbon dioxide are questions for which the data offer no solution" (pp. 834, 835). "The opinion is advanced that the removal of alcohol is an oxidation which does not involve metabolism of the carbon, that products other than carbon dioxide are formed by this means, and that the increase in yeast weight is due to a development of the cells rather than to their multiplication" (p. 836). In a note the authors refer to another scientific communication by H. Lundin, who, they say, "obtained relatively considerable increase in the weight of yeast present, which is attributed to alcohol assimilation and carbo-hydrate formation by the cell. The carbon dioxide is regarded as a product of cell respiration. From this view-point, which was first developed for analogous systems containing sugars, the carbon balances have been carefully worked out" (p. 835 n.). Neither the evidence nor the text books which we have consulted pursuant to the parties' consent disclose any further scientific information as to the manner of the disappearance of the alcohol. The scientific explanation of the fact is of no importance to the invention. It is the fact itself which is important. The word "assimilate" may be a misdescription, although science has not proved its incorrectness so far. But on the whole specification it sufficiently appears that by this the claim intends to cover no more

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than the fact that during the later stage of the fermentation the yeast cell disposes of the alcohol so that it is not there. I am quite unable to see that the patentee was called upon to explain scientifically what happened to the alcohol or that the use of the word " assimilated," even if it be a misuse of language, corrupts the claim. It is then argued that no information is given as to the quantity or percentage of alcohol; that the words of the claim, " formed in considerable quantities," are vague and that no directions are contained in the specification on the subject and no definition is to be found. This criticism does not, in my opinion, take into account the true nature of the invention. The inventor has not undertaken the task of providing a means of producing specific quantities or percentages of alcohol. It is an invention for yeast production. What is claimed for it is that yeast may be produced notwithstanding the presence of alcohol in quantities previously considered inimical to the growth of yeast. Incidentally, the alcohol if desired may be recovered if the process is interrupted before it disappears. Prior knowledge of the amount enables any manufacturer to determine for himself how to increase alcohol production, when to stop if he wants alcohol, and to gauge from time to time the amount of alcohol present. The process invented is applicable to all sorts of concentrations. It is no part of the process to determine the quantity of alcohol present at any given stage. The alcohol content is relative. Under Sak's process it may be relatively great. Under prior processes it was necessary that it should be relatively small. Apart from questions of alcohol production it was contended that the claim and specification were ambiguous and insufficient because the constituents of the nutrient solution were not defined and the degree of departure from uniformity was not defined, and it was not stated whether the process of equalizing extended to additions of inorganic nitrogenous substances. These criticisms again rather miss the point of the invention. The patentee is not called upon to describe all the possible applications of his invention and to deal with the problem which those applications may raise. The tables which illustrate one application of the process make it quite clear that the strengthening of the wort by the addition of a stronger nutrient is not a continuous unbroken process, but is to be done by additions at intervals. The

saccharometer enables a judgment to be formed as to the proper intervals in any particular run of fermentation. It is no part of the invention to prescribe the nutrients to be used. It is capable of application in any class of nutirent. It is plainly directed to the sources of alcohol, and the question raised as to inorganic nitrogen strikes one rather as a quibble. But there is no reason why, if inorganic nitrogen is used in the wort, it should not be added to that in reserve as well as to that in which the yeast is sown. Uniformity of concentration is what is aimed at. But this is to be attained by additions to compensate for subtractions which have already been suffered through consumption by the yeast. No doubt it is for this reason that the metaphor " differential management " is employed. To ask how far uniformity of concentration may be departed from under the process is really to ask how near in a matter of degree the would-be infringer may go without actually infringing. No doubt it is true that the monopoly must be distinctly marked out. But it is not true that when the claiming clauses distinctly claim a novel idea in its applied form they must set exact limitations to its application. In my opinion the specification is not either in its body or its claims uncertain, avoidably ambiguous or insufficient. The difficulties which it may present at first sight arise from a combination of three things, viz., that it is (1) a patent for a part of a process (2) in a highly scientific and highly specialized manufacture, and (3) that it is a patent for a part of a process the true scientific nature of which is obscure.

The question of subject matter to my mind affords no difficulty. It is not a claim for a mere principle, in the sense of a claim for a principle of nature. The invention relates to a definite method of utilizing a phenomenon in fermentation for the purpose of producing an increasing quantity of yeast. It is said that if a favourable concentration was known there is no invention in maintaining it. Such a statement is attractive in its simplicity. But it overlooks entirely the problem of alcohol. Previous practice had dealt with that problem in an altogether different manner. So far from maintaining the nutrient concentration which was thought to be a favourable commencement, the practice was to diminish it. The discovery at the root of the invention is to begin with a dilute wort,

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to add stronger, and to add at a rate which maintains the strength and will develop alcohol and then dissipate it. This discovery, involving as it does the means of applying it to production, affords good subject matter for a patent. *Evatt* J. has dealt so fully with the aspects of the case which may be developed out of the heads which I have considered summarily that I find it unnecessary to do more than indicate the grounds of my agreement with his judgment.

His Honour at the conclusion of his judgment acknowledges his indebtedness to the scientific assessors. There can be no doubt that the decision of this case must be largely affected by the degree of comprehension of the scientific and industrial information and practice the existence of which was assumed by the draftsman of the specification. Courts cannot hope to obtain the necessary standpoint in matters of this description. This fact has been emphasized in a recent case discussed in *Industrial and Engineering Chemistry*, vol. 26, No. 11, November 1934, Editor's page, 1125, 1126. It is there said that, "if full justice is to be done in the adjudication of patents, the judges should have associated with them in a confidential and intimate capacity unbiassed, thoroughly competent, scientific aides. It is becoming more and more apparent that the courts as now constituted can rarely reach just conclusions in matters where new and complicated scientific truths must be interpreted and serve as the only guide posts. In the past we believe there have occasionally been competent judges wise enough to realize this situation. They have known intimately scientists who were qualified and who could be called privately to their assistance to help interpret the mass of highly scientific data recorded by experts in the course of a trial. Such judges have been able to reach the right decisions, for they understood the law and they found a proper way to have the science interpreted to them. . . . Apparently the protection of both science and the public interests requires that provision be made so that authoritative, capable, and unbiassed scientific aid may be available to the courts in all patent litigation. Such a plan is not untried, for it is practised with success elsewhere and with modifications could be adopted with safety and advantage in the United States."

The appeal should be dismissed with costs.

STARKE J. This is a petition for the revocation of letters patent No. 13229 of 1919 for improvements in the manufacture of yeast. The petition was heard by *Evatt* J., who dismissed it, and an appeal is now brought from his decision.

Yeasts are minute plant organisms, so small that they are visible only under a high-power microscope and hence known as micro-organisms. They have been classified in groups, and are distinguished according to the shape of their cells. One of these groups is called Saccharomycetes, of which there are several species. Saccharomycetes cerevisiae are used in the brewing and baking industries, whilst Saccharomycetes ellipsoideus are used in the wine industry. The Saccharomycetes are single cell organisms, and multiply by budding. Under proper conditions they grow and reproduce themselves with great rapidity. The yeast cells contain organic substances called enzymes; they are agents by which chemical changes are brought about in living organisms. Some are sugar-splitting agents, and another, called zymase, is a fermenting agent. The fermenting process is the splitting up of certain carbo-hydrates into alcohol and carbonic acid gas. It is this process of alcoholic fermentation that has been used for many years in the fermenting industries, such as the brewing, distilling, baking and wine industries. The cultivation of yeast pure, and what are called "cell" yeasts, has developed into a special industry. The cultivation of the yeasts is often a major production rather than a by-product of the other fermenting industries. It has already been observed that yeasts require proper conditions for their growth and multiplication. For their growth they require sugars, phosphates, nitrogenous matter, and some mineral salts. A medium is prepared, containing in solution the various ingredients necessary for the growth of the yeasts, raw materials are brought together in a mash tub (grain is largely used because it contains the necessary ingredients for the growth of yeasts), they are prepared by grinding, water is added, and other treatment takes place. The resulting mass is called the mash. The object of mashing, as it is called, is to bring the proteins or other nitrogenous bodies into solution, and to hydrolyse the starches into sugar. The mash itself may be inoculated or seeded with yeast cells, which are thus cultivated. This is known as the

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"Vienna" method. Another method is the "air-grown" method; here the liquid in the mash is drawn off—it is known as wort. Air-grown yeast is yeast grown in a wort through which air is forced. The complete specification thus states the known processes for the manufacture of yeast: "The yeast to be used for propagation is either sown into the total quantity of mash, as in the skim-yeast (Vienna-yeast) method, or, as in the air-grown yeast method, first into the first wort which is then, subsequently, during aeration, diluted by addition of washing water so as to make a certain definite quantity of final wort, wherein the fermentation is completed. In both cases the yeast propagates in a mash or wort becoming during fermentation continuously poorer in nutritive substance, one of the reasons for this being the consumption of substance caused by the propagation of the yeast. In the air-grown yeast method the concentration of the nutritive liquid is reduced, not solely on account of the consumption of the substance due to the propagation of yeast, but also on account of the nutritive solution being diluted by addition of washing water, which addition is continued during the entire washing process."

The concentration of the wort was thus a matter of considerable importance. It was found that too high a concentration of the nutritive solution led to too rapid a conversion of the sugars into alcohol; this withdrew nutriment from the yeast cells and retarded their growth. Conditions favourable to a large yield of alcohol were therefore thought to be unfavourable for a large growth of yeast, and vice versa. Hence dilute worts were regarded as the most suitable medium for the propagation of yeast. The density or specific gravity of saccharine solutions or worts could be determined by well-known methods. Various modifications of the hydrometer were devised for ascertaining the specific gravity of saccharine solutions, e.g., the saccharometer of Balling, and other means. Temperature also was a matter of considerable importance in the propagation of yeast; it grew best at fairly definite temperatures. Acidity, too, had an effect on the activity of yeast—alcoholic ferments work well in an acid medium. Temperature and acidity could be ascertained by well-known methods. Further, in order to grow, yeast requires air.

All this was generally known or accepted in the fermenting industries: it represents the state of the art at the date of the grant of the letters patent the subject of these proceedings. But before examining the specification, the description of the general nature of the invention by two highly skilled witnesses affords considerable assistance. Dr. Chapman made the following statements:—

Q. "You do not regard the advance which he" (the inventor) "made as an advance in technique, but as an advance in a yeast-making principle?"

A. "I regard it as a most considerable advance in the method of manufacturing yeast."

Q. "What I want to try and get at is what advance he contributed to the public knowledge."

A. "His maintaining of the concentration and density. I think that was the principle which led to this improvement in manufacture."

Q. "This process of manufacture involves a principle, does it not?"

A. "Yes."

Q. "And that principle is the addition of nutritive substance so as to obtain an approximate equality of its concentration?"

A. "That is as far as I understand this process."

Q. "That is the general principle?"

A. "That is what I think is the principle."

Q. "That is the real keystone of the process?"

A. "I think so. Yes."

Q. "And you say that is the contribution which he made to the knowledge of yeast?"

A. "Yes."

Q. "As compared with the knowledge that existed before?"

A. "Yes, and to microbiology generally; it was a notion that we did not use in bacteriology generally. It is quite a new conception of the way in which you multiply—cultivate—bacteria or micro-organisms."

Q. "Do you suggest he contributed any advance in technical directions, in the technique of manufacture?"

A. "In the manner of running things in or out?"

Q. "Yes."

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A. " I should not think so. No."

Professor Young made the following statements :—

Q. " Reading the specification as a whole, what do you say it indicates to a person skilled in the art ? "

A. " I would say that the chief feature of it is that you start with a very dilute wort and you are adding a strong wort together with other nutriment, and you are adding it at such a rate that it just keeps good the nutriment in the solution."

Q. " This method of adding a stronger wort to a weaker wort has been called . . . the differential method, adopting a phrase in the specification. This differential method of adding stronger wort to the more dilute wort, in your experience was that known as a method of securing results in fermentations before 1919 ? "

A. " I had not heard of it."

See, generally, *Allen, Commercial Organic Analysis*, 5th ed., vol. 1, pp. 267-293, 355-367 ; *Riegel, Industrial Chemistry*, 2nd ed., pp. 303-323.

The examination of the complete specification of the invention now falls for consideration. It states that in the known processes for the manufacture of yeast the individual yeast generations develop under very different conditions of life, their development commencing in a nutritive liquid of high concentration, i.e., in a surplus of nutritive substance, while the last generations develop under unfavourable conditions of life, i.e., in a weaker solution, where they will be wanting nutritive substance. The object of the invention is to give to the yeast uniform and favourable conditions of life during the entire fermentation process without using other nutritive substances than those utilized in the heretofore-known fermentation process. This is possible, according to the complete specification, when the usual nutritive substances, for instance the mash and wort, are supplied to the yeast in an entirely different manner from that heretofore known. The result is attained if the yeast is sown in a diluted wort or mash suitable for the propagation of yeast, and if the concentration of the nutritive liquid is maintained by equalization or compensation of the consumption of substance, so that the fermentation is directed in a manner which may be called differential. And the patentee thus declares its claim : " Process for the manufacture of yeast,

especially air-grown yeast, in which, in accordance with the so-called differential management of the fermentation, a nutritive substance concentration suitable for the formation of yeast is maintained in the wort or mash during the run of the fermentation, while by the addition of the necessary quantities of wort or mash of higher concentration, any variations in the concentration of the nutritive liquid due to the general vital activity of the yeast are equalized or compensated, whereby alcohol is formed in considerable quantities, which alcohol is either recovered or assimilated by the yeast, but only during the subsequent period of the fermentation."

A high concentration of the nutritive solution led to a rapid conversion of the sugars into alcohol, which retarded the growth of the yeast. So the solution or wort was diluted, and as the process continued wort was gradually added, weaker in nutritive substance. But the specification completely reverses the old order of feeding the yeast. The phrase " differential management of the fermentation " is rather obscure and anything but vivid, but the meaning of the specification is clear enough : the yeast is growing, and as it grows new cells are formed, which require nutriment. The solution should be so compensated or equalized that sufficient nutriment is provided, not only to compensate for that lost in the course of fermentation, but also to supply the developing yeast cells. Alcohol is necessarily formed in the course of the process, but the specification asserts and claims that it either may be recovered or else is assimilated by the yeast or disappears slowly in the course of the process.

It is contended that the process or method is wanting in subject matter. But if the process or method reverses the old order of supplying nutriment to the yeast and thus gives a better yield of yeast or of alcohol or a better control of the process of fermentation, then it is a new method of manufacture and has ample subject matter for the grant of letters patent. It is, however, further contended that the specification does not sufficiently describe the invention and that it is ambiguous. " Insufficiency," it has been said, " is directed to the issue whether the description is sufficient to enable those persons to whom the specification is addressed to understand how the subject matter of the patent, if it is for an article to be manufactured, is to be made, or, if it is for a process or

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method, is to be worked. Ambiguity is directed to the issue whether the invention is sufficiently described and ascertained so as to enable the public to understand the scope of the monopoly granted by the letters patent" (*No-Fume Ltd.* v. *Frank Pitchford & Co. Ltd.* (1)). I shall not go through all the objections taken on these grounds. It might be enough to say that two skilled persons appointed by the Court had no difficulty in understanding and carrying out the process according to the directions given in the specifications and in obtaining the results predicted by it. But in addition the specification has a background of knowledge of the art of manufacturing yeast and of methods for determining the temperature, concentration and acidity of the solution in which yeast is propagated and of the aeration of those solutions. So when it is objected that no sufficient directions are given for the management of the fermentation in a manner which is called differential, the answer is that the common knowledge and practice of the fermenting industries and the methods in use in those industries enable anyone to whom the specification is addressed to determine the amount of saccharine or fermentable matter in the wort at any given moment, and the principal chemical reaction according to which alcoholic fermentation proceeds enables him to estimate the alcoholic formation in the solution. And in addition there are the particular examples set forth in the specification itself to guide and instruct him. After all, the only essential direction is that the concentration of the nutrient solution must be maintained during the course of the process. It must be equalized or compensated, having regard to the multiplication of the yeast cells. So, as to mineral nutrients. The addition of nutritive salts and the manner of adding them in the fermenting process were well known. The specification states that the usual nutritive salts may be added in the usual manner during fermentation, or even in the wort before sterilization. The specification, having regard to all these considerations and circumstances, is not, I think, bad for want of sufficiency or for ambiguity.

A further objection attacks the specification on the ground of misrepresentation. The particulars of objections allege that the patent was obtained by a false suggestion that the process described

(1) (1934) 52 R.P.C. 28, at p. 34; (1935) 52 R.P.C. 231.

in the specification is a process whereby the amount of alcohol present at the end of the process may be controlled and varied, and that the process thus allows the manufacture to be adjusted according to the varying state of the market for yeast and alcohol. This objection gives rise, I think, to the main difficulty in the case.

Several passages in the specification insist that alcohol, in quite considerable quantities, may be present during the fermentation, and may be recovered commercially or assimilated by the yeast, or disappear during the process. "The yeast thus produced, while quite considerable quantities of alcohol are present, appears in quantities corresponding to a yield of about 60 per cent or more, and besides it possesses internal and external qualities of exceedingly high value." And the claim itself is limited to a process "whereby alcohol is formed in considerable quantities, which alcohol is either recovered or assimilated by the yeast, but only during the subsequent period of the fermentation." Now, if the specification suggests that the process will yield a high percentage of yeast, and at the same time a quantity of alcohol sufficient for commercial recovery, then the suggestion cannot be made good: a false representation would have been made, invalidating the grant of letters patent. But a true interpretation of the specification does not, I think, lead to this construction. The process may be adjusted, says the specification, according to the varying state of the market for yeast and alcohol. The alcohol may be recovered, assimilated by the yeast, or caused to disappear. All this suggests that though the production of yeast is the main object of the invention, still the production of alcohol, if alcohol be required, is not limited or precluded. The effort of a manufacturer in the fermentation processes was not always to grow yeast, but "rather to produce just enough yeast to catalyse the alcohol-forming reaction." The specification suggests that the process described permits the regulation of the production and utilization of yeast and alcohol according to the requirements of the manufacturer or the state of the market. There is no difficulty in so regulating the process, having regard to the known methods and practices of the fermenting industries and the examples given in the specification itself.

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Some observations were made upon the possibility of yeast assimilating alcohol. It is uncertain, in the present state of knowledge, whether yeast does assimilate alcohol. But all the specification says is that it is either assimilated or slowly disappears. So long as the alcohol disappears in the subsequent period of the fermentation it is quite immaterial how or why it disappears.

The misrepresentation alleged has not been established.

The particulars of objections also relied upon want of utility in the invention. I did not understand this objection to be pressed on this appeal. At all events, the experiments carried out by Doctors Murphy and Trikojus, under the direction of the Court, affirmatively demonstrated the utility of the process, and the yields of yeast predicted in the specification. The objection therefore fails.

Finally, some paper anticipations were relied upon. I have examined them with some care. But all that I find it necessary to say is that none of them gives any indication which would lead to the process for manufacturing yeast described in the complete specification here relied upon.

The appeal should be dismissed.

DIXON J. The production of yeast depends on a ferment, the detailed chemical theory of which is in many respects uncertain. Yeast is a unicellular organism which proliferates rapidly in a favourable nutrient medium. The nutrient must be a source whence the cells obtain both the material entering into the composition of yeast and the energy for the process of increase. Carbo-hydrates, nitrogen compounds and sulphates are laid under contribution. The chemical changes which are ancillary to the growth of yeast are brought about by its enzymes. Among its enzymes is zymase, which has the property, like a catalyst, of causing a reaction in dextrose, hexose sugar in which the atoms of carbon are six. By complicated steps it is transformed into alcohol and carbon dioxide. By successive changes dextrose is obtainable from the starch of grain by the action of enzymes. In this transformation an enzyme or enzymes supplied by malt or germinating grain play an important part. More than one application of these facts has long been practised in industry.

The present case is concerned with their relation to the commercial production of pressed yeast. The procedure followed in its production falls naturally into two parts. The grain is mixed with the malt and mashed at a proper temperature so that, to as great an extent as possible, the starch will become soluble sugar or dextrose. The mash must stand some time and much bacterial and chemical action takes place. As yeast, a micro-organism, is to be grown in it, the degree of acidity of the mash must be controlled. At one time, when the mash was considered ready, it was sown directly with yeast, which propagated in it. This was called the "Vienna method." But for many years another practice has prevailed. The mash is prepared from grain which is softened with water and crushed, not ground. The nutrient materials, nitrogenous or protein as well as sugars, are drawn off in liquor. The mash is washed again and the liquid of the wash filtered off, and this is done yet a third and a fourth time. These filtrations are the wort into which the seed yeast is sown. It was established many years ago, by Pasteur it is said, that in the absence of atmospheric oxygen yeast consumed in its growth a quantity of sugar surprisingly greater than in the presence of air. Accordingly the liquid wort is aerated throughout the period of the yeast fermentation. The control of temperature, sterilization, the use of inorganic contributions to the nutriment and many other matters are involved in the process. When the yeast has broken down the nutrient properties of the wort to such an extent that the ferment should be terminated, the yeast is separated mechanically from the liquor. The alcohol contained in the liquor may be worth recovering and this is done by distillation. The sugar content of the wort, determining, as it does, its density, is ascertainable by a saccharometer. Tables have been constructed by means of which the concentration of the wort can always be found. The proportion of alcohol in the wort is also ascertainable without difficulty. Alcohol is, of course, a product of the fermentation and its increase in the wort appeared to be an unavoidable concomitant of the growth of the yeast. But alcohol, at any rate in particular conditions and proportions not exactly determined, proved a most powerful retarding agent in the propagation of yeast. It was said to be a poison for the yeast. Rich worts produced alcohol; "strong

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spirit brews" they were called. To prevent the production of an excessive amount of alcohol it was, until 1919, the practice to reduce the strength of the wort. The solution was further weakened, as the fermentation proceeded, by adding the washing waters which had been run through the mash after the first liquid had been drawn off. It is hardly necessary to say that the appliances and plant employed in the manufacture of yeast have long been elaborate, and much chemical and other special knowledge has always been required of those conducting the operations.

By a series of experiments in Denmark Soren Sak discovered that, if, instead of following the practice of allowing the yeast to proliferate in an ever-weakening concentrate, the nutrient value of the concentrate was maintained to the end of the fermentation, a valuable increase might be obtained in the quantity of yeast produced, and that this was so notwithstanding the production at the earlier stage of the fermentation of quantities of alcohol which in existing practice would be detrimental. He found that the alcohol largely disappeared during the later stages of the fermentation. By stopping the fermentation the alcohol which otherwise would disappear might be recovered. Why the alcohol thus disappears has been the subject of scientific investigation since Sak's discovery, but without much result. The theory which at present appears to hold the field is that alcohol suffers some transformation into carbon dioxide effected by the yeast in the presence of air, perhaps by direct oxidation, perhaps by the carbon passing through the material of the cell. Other products are formed simultaneously, it is thought, from the alcohol components, but they have not yet been detected.

Soren Sak applied his discovery practically to the manufacture of yeast, and as an invention he assigned it to the respondents, who obtained for it in Australia a patent dated 7th November 1919.

By a petition dated 9th November 1932 the appellants applied to this Court for the revocation of the patent. After a full investigation the petition was dismissed by *Evatt* J., who dealt exhaustively in his judgment with the grounds upon which the petition was based.

From his decision the present appeal is now brought.

To a great extent the appellant's case depends upon criticisms of the specification. Sak's discovery has proved of great value. Its application to the process of yeast making involved a change of method quite unheard of and the paper anticipations cited seem to be remote from it. But the question is not whether the appellant's case is deficient in merits, but whether the attack upon the patent has a firm legal foundation.

In some measure the faults found with the specification exist only if more is ascribed to the invention than the specifiction actually claims. The claiming clauses are strictly confined to the improvement effected in the art by maintaining a nutrient concentration during the fermentation by adding the stronger wort to equalize or compensate for the progressive loss accompanying the growth of yeast. All the known practices are assumed without description, although many of them are alluded to. What concentrations are appropriate, what organic and inorganic constituents are or should be used, what temperatures and what aerations are suitable, are all matters treated as depending upon prior knowledge and general experience. So too is the effect obtained in lessening or increasing the production of alcohol by means of heat concentration and aeration. The invention lies in the introduction into this mass of common knowledge and daily practice of a new method or principle of procedure. It is no business of the patentee to work out in detail a precise programme for applying the new method to all the variations in accepted practice which the objects and exigencies of manufacture might lead them to make. Variations in one direction might be favourable, in another unfavourable, to the production of yeast, some manipulations might increase, others reduce, the yield obtained. These are matters which neither could nor do form part of his invention.

The failure of the specification to give directions in reference to them does not appear to me to constitute insufficiency.

In the course of detailing the steps constituting the second example of an application of the process which the specification gives, it refers to the addition of ammonium sulphate and again of ammonia water. It is said that there is evidence that the latter

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was a practice not known here and that there is no evidence that the former was a known practice in Australia. Even so it does not appear to me that the reference to the supposedly new knowledge matters. It is beside the point of the invention. The invention would be applicable to a concentrate composed of nutritive materials which had never been heard of at the time it was made, if such a thing can be imagined. It is, so to speak, a method of administering them to the growing yeast whatever they be.

In one aspect the invention is very wide, in another narrow. Its object as stated in the specification is to give the yeast as far as possible uniform and favourable conditions of life during the entire fermentation process without the use of any novel nutrient. The object is attained, the specification says, if the yeast is sown in a diluted wort or mash suitable for the propagation of yeast and if the concentration is maintained by equalization or compensation of the consumption of substance. " Equalization or compensation of the consumption of substance " is a clumsy expression. But its meaning is clear enough. As the proliferation of yeast breaks down the nutrient content of the wort, " consumes " it in the wide and correct sense of that word, and as the wort accordingly weakens, its strength is to be restored by additions of the stronger wort. In order to maintain the concentration in spite of the consumption occurring, the process may be commenced in a manner contrary to the practice obtaining, and the last washing water, or a mixture of it and the last but one, may be used as the wort in which the seed yeast is sown and the stronger liquor first obtained added.

Two examples are given, one in detail, of the progress of fermentations so conducted. It appears plainly from a comparison of one example with the other why it is that no direction is given as to the degree of concentration to be adopted and maintained. The degree of concentration is a matter of choice or judgment depending on considerations, including the results desired, which are independent of the invention. The invention lies in the process of maintaining the concentration when adopted. Why no further directions are given as to how the concentration is to be maintained does not appear from the document but it does appear from the evidence of

common knowledge, including text books, which, under the very sensible agreement of the parties, have been made in this case a legitimate source of information. By the use of the saccharometer a constant check can be maintained upon the concentration of the wort. Its strength can be maintained by the addition of a stronger liquor, the concentration of which is known by the same means. Compensating for the loss of nutrient by additions from the stronger concentrate is a process for which the specifier needed a compendious description. He found it in the expression " differential management." He says : " The concentration of the nutritive liquid is maintained by equalization or compensation of the consumption of substance, so that the fermentation is directed in a manner which may be called differential " ; and in his claim he alludes to it as " the so-called differential management of the fermentation." The use of this figure of speech has proved unfortunate. The appellant complains that " differential " is not a known term in the art of yeast manufacture ; that it conveys no clear meaning and introduces uncertainty and ambiguity. The *Oxford English Dictionary* gives the meaning of the word in physics and mechanics as " relating to, depending on or exhibiting the difference of two (or more) motions pressures temperatures or other measurable physical qualities." The idea the specifier intended the word to express is clear enough. As the yeast subtracts from the concentrate, the manager of the fermentation adds correspondingly.

Evatt J. said :—" This word vividly describes the outstanding feature of the invention. Under the new process, yeast is to be sown in a diluted wort or mash suitable for propagation, and then the process is to be controlled so that the consumption of nutrient substances caused by the propagation and growth of yeast is balanced, and no more than balanced, by adding a sufficient supply of stronger nutrient to the liquid in which the yeast is propagating. The word ' differential ' implies a balancing of one rate of change against others. Sak's method of controlling the process is quite analogous —as is suggested—to the difficulty presented, not so much in *solving* a differential equation as to the preliminary and greater difficulty involved in *writing it down*. He claims that a certain relation exists in which the element of time (the fermentation process takes

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many hours) becomes all-important. In this way, he emphasizes, not only by his use of the term 'differential,' but throughout the specification and by his particular examples and directions, that he is concerned with the adjustment of yeast growth (at a certain rate), consumption of nutrient substances as a result of such growth, and the furnishing of additional nutrient substances at such a rate as will compensate for the consumption of substances, having regard to the rate at which they are consumed. It is not merely a question of adding additional nutritive substances in a haphazard or unordered way, but of adding them in a particular way so as to compensate for consumption losses" (1).

This passage, in the course of justifying the specifier's terminology, states clearly the invention. But after all the expression is only referential. The description of the invention is not dependent upon it; the invention is described in the specification at length, and the description is illustrated by examples.

The first claim, upon which the second and third depend, is as follows:—"1. Process for the manufacture of yeast, especially air-grown yeast, in which, in accordance with the so-called differential management of the fermentation, a nutritive substance concentration suitable for the formation of yeast is maintained in the wort or mash during the run of the fermentation, while by the addition of the necessary quantities of wort or mash of higher concentration, any variations in the concentration of the nutritive liquid due to the general vital activity of the yeast are equalized or compensated, whereby alcohol is formed in considerable quantities, which alcohol is either recovered or assimilated by the yeast, but only during the subsequent period of the fermentation."

This claim is attacked in the first place as an insufficient and ambiguous definition of the monopoly. It is conceded that resort to the body of the specification is permissible for its better understanding and elucidation. But this, it is contended, does anything but remove the faults complained of.

The first objection raised to the claim on this ground is one not comprised, so far as I can see, within the appellant's particulars. We therefore should not entertain it (sec. 86 (5) of the *Patents Act*

(1) *Ante*, p. 538.

1903-1935). But it may be desirable to add that I do not think it would have been sustainable. The objection is that it is uncertain whether the process for which the monopoly is claimed applies only to the addition of wort or mash or also to other nutrients. The answer is that it applies to nutrients which enter into the " concentration," a term well understood in the art of yeast manufacture. If nutrients do not affect the degree of concentration, are not reflected in the " Balling," they are not within the claim. Some difficulty exists in dealing with the matter in greater particularity because naturally evidence was not directed to show what, if any, possible inorganic additions fell outside this principle.

Next it is complained that it cannot be ascertained from the claim what degree of departure from strict uniformity in the concentrate takes a particular manipulation of the nutrient outside the monopoly. It does not appear to me to be by any means clear that this objection comes within the appellant's particulars. However that may be, it impliedly seeks to fasten upon the claim a meaning which it does not possess. The process claimed is not one of maintaining continuous uniformity or continuous approximate uniformity. The process is for the repeated re-establishment of a degree of concentration from which there is a continual departure. The word " maintained " is used perhaps in a logically inexact sense but one which is frequent and well understood. The invention relates to an applied principle and it states with reasonable precision what is the application of the principle for which protection is claimed.

Again, it is complained that the description " considerable " given to the quantities of alcohol formed is vague. No doubt it does not specify an amount by weight, volume or proportionate relation to the weight or volume of the wort or other material. No doubt too it operates as a limitation of the monopoly. But its object is to distinguish the presence of alcohol in quantities which when considered might be disregarded from the point of view of commercial recovery and of detrimental effect under existing practice upon the production of alcohol. It is difficult to see how greater precision could be achieved or what real uncertainty those instructed in the art would feel.

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A fourth criticism was made of the claim. It was objected that alcohol is not " assimilated " by the yeast. For all that is scientifically known at present it may in fact be assimilated in the sense put upon the word by the appellant: the yeast may absorb it into the cell. But this word should be understood reasonably in the light of the body of the specification. Whether the alcohol is broken down and furnishes energy to the yeast or provides it with a material component or simply disappears, is quite irrelevant to the process. The point is that it is " consumed " and does not remain. The specification refers to the phenomenon by various expressions, " disappear," " consumption," " utilization " and " assimilation." At worst it amounts to an error of science. More probably it is a misuse of English. But, in any case, the meaning is clearly enough conveyed. The manner in which the specification deals with alcohol will receive fuller consideration under another head of objection, namely, misrepresentation. But, before entering upon that subject, it is, perhaps, as well to deal with the objection that the claim discloses no subject matter. This objection was dismissed by *Evatt* J. as quite untenable, for reasons in which I agree. Before us, however, it seems to have been presented in a somewhat different way. The ideas expressed or implied in alleged paper anticipations were relied upon as depriving Sak of originality in the idea of uniformity of concentration, and the idea of obtaining it by adding stronger nutrient to weaker. I think the use sought to be made of these anticipations, although attempting to avoid, yet really infringes upon, the well-known principles which require that a writing relied upon, not a number when pieced together, shall contain such information as would enable a person of ordinary skill and information in the art at once to do what is disclosed by the specification impugned and to do it without the exercise of inventive ingenuity.

In my opinion, there is clearly subject matter in the invention and it was not anticipated.

The validity of the patent is also attacked upon the ground that the specification claims for the invention a result which cannot be achieved. The specification is interpreted as representing that the process it describes will give enough alcohol for commercial distillation as it is practised in Australia and at the same time produce

an amount of yeast equal to about 60 per cent of the raw material used.

It appears that in Australia distillation from a liquid containing less than four or five per cent of alcohol is not commercially practised, although in other countries a much lower percentage is recovered profitably. The higher proportion demanded in Australia is attributed to a supposed over-production of alcohol owing to the quantities of cane and molasses available, to the cost of the necessary plant, and to the discouragement offered by an excise and by stringent regulations. It is unnecessary to consider what is the minimum percentage of alcohol which may be recovered here with profit. For I do not think that the specification either expressly or by implication makes the profitable production of alcohol in Australia the measure of the results it promises.

But this does not meet the substance of the contention, which is that the patentee undertakes by his invention to produce simultaneously quantities of alcohol and quantities of yeast, which it is not possible to obtain from the same wort by any application of the process discoverable from a study of the specification or, for that matter, by independent experiment. As the appellant interprets the specification, it represents that by means of the process a fermentation may be so conducted that it will yield more yeast than previous practice would produce, on one construction as much as 60 per cent of the raw material, and at the same time leave in the liquid a quantity of alcohol amounting to 20 per cent by weight of the raw material from which the wort was expressed. If such a representation is to be found in the specification, it is clear that the expectation it raises cannot be made good. On the contrary, a reason given in the course of the evidence for reading the specification as meaning an altogether different thing was the absurdity involved in the appellant's interpretation. The sugar content of the wort might be called the raw material of the alcohol and it might allow the recovery of a quantity of alcohol amounting to 20 per cent of its weight, while at the same time an increased yield of yeast was obtained. So understanding the calculation of the percentage of "raw material," it appeared intelligible to the instructed mind. Otherwise, it was said, it would be a ridiculous figure, an impossibility,

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it would not mean anything. The passage of the specification referring to 20 per cent does not, as I read it, deal with the recovery of alcohol but only with the amount of alcohol occurring at a stage of the process. But the substantial question is whether the specification does represent that the process may be so applied that by the same fermentation from the same wort a large yield of yeast will be obtained and alcohol will remain available in a quantity sufficient for commercial distillation. A number of statements and expressions contained in the specification were collected together in order to establish the making of this representation. It is needless to set them out again. They combine to make the interpretation plausible. Nevertheless, an examination of the whole document has led me to the conclusion that it is a mistaken reading of the specification. It arises from a failure to appreciate the nature of the incidental advantage claimed for the process. It is that it allows the subordination of the production of yeast to the recovery of alcohol. This incidental advantage is a consequence of the otherwise apparently accidental feature of the invention, that it makes possible the growth of yeast in the presence of alcohol. But it is another feature of the process that, if the fermentation to which it is applied is carried through to its normal conclusion when the yeast is separated from the wort, the alcohol will have been largely consumed. This feature is incorporated in the claims themselves, which afford a striking illustration of the alternative character of the recovery of alcohol.

The first claim, which is embodied in the two succeeding claims, ends with the words " whereby alcohol is formed in considerable quantities, which alcohol is either recovered or assimilated by the yeast, but only during the subsequent period of the fermentation." It means that to recover the alcohol the fermentation must be stopped, otherwise the alcohol will be used up. But the fermentation can be prematurely stopped only at the expense of the yield of yeast.

To some extent a misunderstanding of the specification is made easier by the ambiguity of the word " during " which is used many times in the course of describing the relation of the process to alcohol. It is used, not in the sense of " throughout the period of the fermentation," but in the sense of " at a point of time within

that period." But, detached from the context, phrases in which the word occurs may appear to state that considerable alcohol is produced or is present "during," in the sense of "throughout," the process. A sentence in which the ambiguity is removed by the context serves also to make it clear that recovery of alcohol is not contemplated where the process is carried to its normal conclusion. The material part is expressed thus: "Even quite considerable quantities of alcohol may be present during the fermentation, and the process should therefore be carried [out] not only in such manner that such quantities of alcohol are formed and are present during the fermentation but also so that the alcohol is not utilized by the yeast until during the further run of the fermentation, the alcohol being utilized or assimilated." Again it is stated that by the process an adjustment of the concentrations is made, not only favourable to the growth of yeast, but also giving "a quite appreciable formation of alcohol, so that the alcohol may either be caused to disappear again slowly during the process, or may be caused to remain, wholly or partially, as desired." The very next sentence speaks of "a formation and conversion of alcohol going on co-ordinarily with the attainment of high yields of the best yeast." "Conversion" means that the alcohol is transformed and lost. It does not mean that it is distilled. Distillation does not "go on co-ordinarily." It is a subsequent process, and "conversion," in any event, is a word which could not be used to describe it. The table contained in the second example given in the specification affords a detailed illustration of the progress of such a "conversion." The greater initial concentration of the wort in the first example gives an application of the process of a kind in which "the alcohol will be present, or may be present, in a concentration enabling it to be recovered commercially". But, that this result is obtained at the expense of the yield of yeast is made plain by the text, and not merely left to the common sense of yeast manufacturers. For the specification proceeds: "By a slight variation of the temperature, the aeration or the manner in which the wort is added, the amount of alcohol present at the end of the process may be varied. The present process thus allows the manufacture to be adjusted according to the varying state of the market for yeast and alcohol."

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In other words, if you apply the process to a wort of high concentration, you will or may, while engaged primarily in yeast production, obtain enough alcohol to recover it commercially : " commercially," not " profitably according to Australian conditions, current for the time being." If you really want alcohol, you must resort to the familiar practices to get it, increase your temperature, aeration, concentration. Thus, when yeast is cheap (and you don't want high yields) you may obtain alcohol by this process.

As *Evatt* J. said, " the outstanding clue to the relation between alcohol and yeast production under the process is to be found in the statement " last quoted. " This clearly implies that the process should not be regarded as giving at one and the same time the *maximum* production *both* of yeast and alcohol " (1).

In the specification the two sentences under discussion are preceded by a statement already referred to upon which much reliance is placed by the appellant. It is this : " During a fermentation as carried out in the above example, alcohol will be produced in quantities which may amount to 20% or more of the raw material corresponding to the quantity of wort present in the fermentation vat." It is reasonably clear that " during " here refers to a time occurring in the progress of the fermentation. The assertion is that at a stage in the process the production of alcohol may rise as high as 20 per cent of whatever the standard of calculation may be. From all that precedes as well as the detail that follows under the heading example II., it would be plain to a reader familiar with the subject that no assertion is made or implied as to the continuance of that percentage in the wort until the close of the fermentation. Indeed, if the alcohol were not " consumed," " assimilated," " converted " or " utilized " in the manner stated in the previous part of the specification, there would be something erratic in the operation of the process. But the next sentence dispels all doubt upon this subject, because it says that " in fermentations as those here referred to " alcohol will or may be present in a concentration sufficient for commercial recovery. Upon this reading of the passage, *Evatt* J. has found that the statement it makes is borne out in fact even if the 20 per cent is calculated on the original raw materials contained in the

(1) *Ante*, p. 542.

mash. No evidence to the contrary has been discovered. But, in any event, the expression "20% or more of the raw material corresponding to the quantity of wort present in the fermentation vat," while obscure, does not seem to refer to the initial quantity of raw material. It seems to refer rather to an amount of raw material still represented in the wort. The form of expression describes a correspondence between the wort present when the quantity of alcohol is calculated and the raw material. There is a good deal to be said for interpreting the phrase as expressing the alcohol content attained by the wort in the progress of the fermentation by the fourth of the five methods which *Evatt* J. has said are available for the expression of alcohol yields, viz., a percentage based on the total soluble materials in the wort which has been obtained from the mashing process. But however that may be, the specification does not upon its true interpretation contain the representation relied upon by the appellant. Upon this subject it may be remarked that the present attempt to fix upon this specification a representation or undertaking which could not be fulfilled by the invention is open to the well-known observations about the construction of claims which Sir *George Jessel* M.R. made in *Plimpton* v. *Spiller* (1):—

"There are few patents of complicated inventions even as regards the text and drawings where some mistake or other is not made. Accuracy, as we all know, is very difficult of attainment; and when the judge sees that there is a real substantial invention of great merit, and the description is fairly made, so that a competent workman can make the invention, it is not his duty to endeavour to construe the patent so as to make it claim that which it is utterly absurd to suppose would be claimed, because it is so well known as a matter of public notoriety, that nobody would think of claiming such a thing."

In dealing with this case I have not gone over in detail all the subsidiary arguments advanced in support of the grounds of attack. In many instances they were inconsistent with the view of the specification I have expressed, and in the course of stating that view I have disposed of them. But in any case very few of them

(1) (1877) 6 Ch. D. 412, at p. 423.

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have escaped examination in the judgment appealed from, with the reasoning of which I entirely agree.

In my opinion the appeal should be dismissed with costs.

McTIERNAN J. At the hearing of the petition voluminous evidence was given as to the meaning of the technical terms and the state of knowledge in the art of yeast-making. *Evatt* J. had the assistance of two assessors, who by consent of both parties were appointed by the Court to carry out experiments founded on the directions contained in the specification and to furnish a report. Their elaborate report is in evidence. The parties also gave his Honour liberty to consult the assessors out of court in the absence of the parties and to inform his mind as to matters in issue by reference to text books. The report of the assessors is entirely favourable to the respondent. His Honour found as a fact that a person skilled in the art could by following the examples in the specification obtain substantially the yield of yeast promised, having regard to the amount of raw materials used. That yield was uncommonly large by contrast with the yield which could be obtained from a similar quantity of raw materials. His Honour found also that the quantity of alcohol which was formed during the experiments was substantially equivalent to that which the patentee promised, even according to the appellant's interpretation of the specification. In so far as the appellant's case depends upon these and other questions of fact I think it impossible to disturb his Honour's findings of fact, which were all adverse to the appellant. We lack not only the usual advantages which the primary judge had, to determine questions of fact, but the added advantages, consultation with the assessors and reference to text books which were available to him by the express consent of the parties (*Mersey Docks and Harbour Board* v. *Procter* (1); *Federal Commissioner of Taxation* v. *Clarke* (2)).

The first objection to the validity of the patent which it is convenient to consider is that claim 1 is ambiguous. No separate attack was made on the other claims. The claims should be interpreted in the light of the body of the specification and the common

(1) (1923) A.C. 253, at pp. 258, 259. (2) (1927) 40 C.L.R., at pp 292, 293

knowledge in the art. The learned judge's summary of the specification was accepted as correct by the appellant's counsel.

The nutrients for yeast are sugar and nitrogen, which are derived from the mash or wort in which yeast is sown. Some of the raw materials from which mash or wort is made are richer in nitrogen than others and it is common knowledge that inorganic substance, e.g., ammonium sulphate, might be added to the mash or wort to increase the nitrogenous content. As fermentation proceeds the yeast splits the sugar or dextrose in the mash or wort into equal parts of alcohol and carbon dioxide. It was a matter of common knowledge how to measure the sugar concentration and the nitrogenous contents of the medium in which the yeast grows, and to gauge its acidity.

The specification gives a reasonably correct account of a defect which was characteristic of the two known processes, the " skim-yeast (Vienna-yeast) method " and the " air-grown yeast method." As to these processes it says :—" In both cases the yeast propagates in a mash or wort becoming, during the fermentation poorer in nutritive substance, one of the reasons for this being the consumption of substance caused by the propagation of the yeast." The specification says that when the air-grown method is employed the nutritive medium also deteriorates, " on account of the nutritive solution being diluted by the addition of washing water." This refers to the wort obtained from the mash by filtration. The yeast was sown in wort less dilute than the wort which was subsequently added. The defect in both of these processes, to which the specification draws attention, is that the yeast developed under unfavourable conditions of life and the formation of alcohol during a fermentation conducted according to either of these methods retarded the production of yeast. In the case of the skim-yeast method, the detrimental effect of alcohol to the production of yeast is stated to have been especially prominent. When the " air-grown yeast method " was used, an attempt was made to overcome this disadvantage by selecting suitably weak solutions in which the alcohol formed could not materially injure the propagation of yeast. Commenting on this provision the specification says : " This process, however, has for effect that the alcohol produced will be lost, as it will not

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be feasible, in practice, to recover the alcohol when diluted beyond a certain limit."

The object of the alleged invention as stated in the specification is to give " uniform and favorable conditions of life during the entire fermentation process without using other nutrient substances than those utilized in the heretofore-known fermentation process." It is said that it is possible to provide these uniform and favourable conditions for the propagation of the yeast " when the usual nutritive substances (that is, for instance, mash and wort) are supplied in an entirely different manner from that heretofore known." The patentee discovered that, by the management of the fermentation in a manner which he calls " differential," uniform and favourable conditions of life are given to the yeast, resulting not only in an uncommonly large yield of yeast, but also in the formation of " considerable quantities " of alcohol. The manner of manufacturing yeast by the differential management of the fermentation is then described, and two examples of a fermentation conducted according to this method are given. The alleged invention is this manner of manufacture. The yeast is sown in a " diluted wort or mash suitable for the propagation of yeast " and " the concentration of the nutritive liquid is maintained by equalization or compensation of the consumption of substance." The method of maintaining the concentration, which constitutes part of the manner of manufacture, is explained in the following terms: " In contradistinction to the heretofore followed practice, the process may be commenced for instance by sowing the yeast into the last or a mixture of the last and the last but one washing water (the term ' washing water ' being taken to mean the liquid flowing from the filtration plant), whereafter addition is made of the stronger washing waters obtained at the beginning of the filtration, and of the first wort, according to requirements in order that the concentration may be maintained in spite of the consumption of substances occurring." The process is also illustrated by the two examples. Before this specification it was common practice to avoid forming alcohol during the fermentation as it was regarded as detrimental to the propagation of yeast. Accordingly yeast-makers strove for a solution with the lowest degree of sugar concentration compatible with the growth of yeast,

thus avoiding comparatively the formation of alcohol. Thus alcohol would be formed only in negligible quantities. But the patentee, having discovered that the result of maintaining the concentration of the nutritive substances was an uncommonly large yield of yeast and the formation of alcohol in considerable quantities, has made such formation an essential factor of the process. The specification says : " An extensive series of practical experiments have shown in the production of good bakery yeast with uncommonly large yield, according to the present process, that even quite considerable quantities of alcohol may be present during the fermentation, and the process should therefore be carried out not only in such manner that such quantities of alcohol are formed and are present during the fermentation but also so that the alcohol is not utilized by the yeast until during the further run of the fermentation, the alcohol being utilized or assimilated." This factor in the process is again described in these terms : " According to the present invention the concentrations during the fermentation are not only adjusted in such a manner that they become favourable to the propagation of yeast, but they are also at the same time adjusted in such a manner that they furthermore give a quite appreciable formation of alcohol, so that the alcohol may either be caused to disappear again slowly during the process, or may be caused to remain, wholly or partially, as desired."

The further run of the fermentation is the last stage of the process : the first is a " lag " or dormant period and the intermediate stage is " the run of the fermentation." The alleged invention, therefore, consists of a manner of manufacturing yeast which is carried out by sowing the yeast in the more dilute of the filtrations of mash or wort and maintaining the concentration of the nutritive substances constant in such mash or wort, by adding, during the run of fermentation, the relatively less dilute filtrations of mash or wort, the concentrations of the sugar in the mash or wort being adjusted so as to form considerable quantities of alcohol and to cause the alcohol to remain until the end of the process or in the alternative to be " utilized " or assimilated by the yeast.

In my opinion claim 1 defines with sufficient certainty the area of the monopoly granted for this process of making yeast. The

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" differential management of the fermentation " is a phrase coined by the specifier but its meaning is defined by the specification. The maintenance of a constant of nutritive substances in a mash or wort may require the addition of inorganic substances, that is, ammonium sulphate, to replenish it with nitrogen. But the characteristic of the invention is the maintenance of a constant concentration adjusted to form alcohol in considerable quantities, by adding, during the fermentation, wort of a higher concentration than that in which the yeast was sown. The skilled yeast-maker would know whether a practical constant was being maintained in the concentration of the nutritive substance. There were tests and instruments in common use for this purpose. If he maintained this constant by " the addition of mash or wort of higher concentration " he would be within the ambit of the monopoly. The common practice having been to sow the yeast in the less dilute filtrations of mash or wort, it is not doubtful, I think, that a practical yeast-maker would not fail to appreciate the meaning of the description " higher concentration." The former processes strove to avoid the formation of alcohol, and the term " considerable quantities of alcohol " marks the contrast between the results achieved by the present process and a mere negligible amount of alcohol. The term is explained by the specification and it indicates any volume of alcohol which may in a practical sense be described as " considerable " or " appreciable " or is capable of commercial recovery as distinct from recovery in a laboratory.

It is contended by the appellant that the question whether yeast may assimilate alcohol has not been scientifically determined, and that it would therefore be impossible for a manufacturer to know whether he was inside or outside the ambit of the monopoly if he managed the fermentation in a differential manner, adjusted the concentration to form alcohol as well as yeast, but caused the alcohol to disappear from the wash. The appellant has not, I think, discharged the onus of proving that alcohol may be made to disappear without being " assimilated " by the yeast. Reverting to the specification, it is noticed that " assimilated " is used as an alternative to the expression " utilized." Diverse opinions were expressed by the expert witnesses on this question, and Mr. *Flannery* referred

to an authority which tends to support the view that alcohol may be assimilated by yeast (*Journal of Biological Chemistry*, vol. 62, pp. 823-836). I do not think that this allegation of uncertainty in the definition of the monopoly has been established.

So far as regards the other objections, insufficiency, anticipation, want of subject matter, and the allegation that the patentee has promised results which it is impossible to achieve, I agree with the reasons of *Evatt* J. for dismissing these objections. On the question of subject matter, the judgment is supported by the decision in *Hickton's Patent Syndicate* v. *Patents and Machine Improvements Co. Ltd.* (1).

In my opinion the appeal should be dismissed.

Appeal dismissed with costs.

Solicitors for the appellant, *Allen, Allen & Hemsley.*

Solicitors for the respondents, *W. A. Windeyer, Fawl & Windeyer.*

J. B.

(1) (1909) 26 R.P.C., at pp. 347, 348.