TABLE III.
Gallic acid equivalent to non-tannins.

Extract.	Gelatine salt and acid.	Freiberg unchromed powder.	Vienna unchromed powder.	Pacessler's chromed powder.	American chromed I.A.L.T.C.
Oakwood, (reputed)	0.255	0.221	0.163	0.149	0.149
Oakwood, Gondolo	0.160	0.144	0.132	0.115	0.115
Chestnut, solid	0.331	0.354	0.320	0.242	0.245
Chestnut, liquid	0.297	0.300	0.297	0.209	0.199

It will be observed that in most cases the non-tannins are highest in the case of gelatine precipitation, though in some cases they are approached or even exceeded by the unchromed hide-powders used by shaking, while those of the chromed powders are invariably much lower. It appears therefore that as regards the oxidisable matters estimated by permanganate, the unchromed powders give results nearer the scientific truth, but the much closer concordance of the chromed powders fully justifies their use for commercial purposes, and further it must be remembered that in gravimetric analysis these oxidisable and generally astringent non-tannins form only a small portion of the whole. The close agreement of Prof. Pacessler's lightly chromed powder with that officially chromed, establishes the suitability of the former as a detannising agent for the Löwenthal process, and encourages the hope that a dry chromed powder may ultimately be produced, which will avoid not only the chroming, but the much more troublesome washing immediately before use which is now required.

If the gelatine method is preferred to hide-powder for liquor control it is quite as rapid, and probably less affected by large amounts of non-tannins, but the results are not directly comparable with gravimetric analysis, and some samples of gelatine exercise a slight reducing effect on permanganate, not amounting in blank experiments to more than about 0.2 c.c. per 10 c.c. of the non-tannin filtrate, and probably due to traces of sulphites. This, if desired, is easily determined and allowed for.

DISCUSSION.

Prof. W. M. GARDNER suggested the investigation of the effect of reducing instead of oxidising substances on tannins. The action of the latter was the basis of the methods of estimation at present used. If a definite substance such as benzoic acid could be obtained as a result of reduction, much more definite results might be obtained. Under certain conditions tannic acid and many other phenolic bodies gave benzoic acid on reduction.

Mr. F. W. BRANSON asked if absolutely pure chemicals were necessary when a correction factor could be used.

Mr. H. G. BENNETT said that difficulties were always experienced with certain tannins where the methods of estimation broke down. He emphasised the value of a volumetric method such as the Löwenthal method, which combined speed and accuracy, since the hide-powder process involved difficulties such as the possible presence of difficultly volatile substances like lactic acid, the impossibility of drying the exhausted extract to a constant weight, &c.

Note by Prof. H. R. PROCTER: I have not tested the recently-suggested reduction methods for the investigation of tannins, which are of great scientific interest, but do not seem as yet likely to supersede those in use for practical estimation. In reply to Mr. Branson's question, there is no doubt that in many cases absolutely pure chemicals are of the greatest importance. In the Löwenthal process the purity of the gallic acid is of the highest importance, and the indigo must be free from indigo red and other products which obscure the end-point.

NOTE ON THE DIFFUSION OF CHROMIUM, IRON AND ALUMINIUM SALTS THROUGH GELATINE JELLY.

BY PROF. H. R. PROCTER AND DOUGLAS J. LAW.

The experiments described in the following note were prepared in the first instance as a lecture demonstration, but though the results throughout must merely be regarded as qualitative they appear to present some points of interest which make them worthy of a permanent record.

If a solution of a coloured crystalline salt, such as copper sulphate, is poured on the top of solidified gelatine jelly, it diffuses into it somewhat rapidly, its progress being easily traced by the change of colour in the transparent jelly. It has been shown by Fick that in many cases diffusion in jellies is practically as rapid as in still water. In the case of coloured substances of a less definitely crystalline character the diffusion is slower, and the ultimate penetration less, while solutions of a distinctly colloidal nature either do not penetrate at all or do so to a comparatively small extent. If a mixture of two coloured substances is employed of different degrees of diffusibility two zones of diffusion are formed, of which the deeper consists only of the more diffusible substance. When operating with colourless salts, bases, or acids, it is frequently easy to determine their progress by the addition of a suitable indicator, thus that of strong bases is shown by the addition of phenolphthalein, or that of acids, by the same reagent coloured with a trace of caustic alkali.

As salts of chromium and other metals of the same group are very prone to hydrolysis and the formation of basic salts, it was of interest to determine not merely the progress of the chromo salt but that of the hydrolysed acid, and for this purpose a 5 per cent. jelly was used coloured pink with slightly alkaline phenolphthalein. This was allowed to set in Nessler cylinders, or for the purpose of lantern demonstration, in parallel-sided cells, and the solution to be tested was poured upon the top of the jelly. That gravitation had little influence on the rapidity of the diffusion was proved by repeating a similar experiment with an inverted tube. As the chromo salts diffused into the jelly, their progress was clearly noted by their colour, which, whatever the colour of the solution, is generally in the jelly of a dull bluish green, somewhat

between the colour of the well-known green and violet modifications. As, however, the chrome salts hydrolyse considerably, the penetration of the acid was much more rapid, with the consequence that a broad zone was formed beyond the chrome in which the colour of the phenolphthalein was discharged. As a rule the boundaries of these zones, though naturally shading into each other, were sufficiently sharp to allow of easy approximate measurement, especially as regards the edge of the diffused chrome salts. That of acid was distinctly sharper in the case of chrome alum than in that of chromium chloride solution. The results of these experiments are shown in the following tables, the depth of diffusion being stated in centimetres. Experiments were made with a half-saturated solution of chrome alum containing about 1 per cent. of chromium and with a 10 per cent. solution of chromium chloride containing 1.4 per cent., 10 c.c. being in each case placed above the gelatine in the Nessler tube. As the first experiments were not intended to be qualitative, this solution was not renewed, but it must be observed that under these conditions the diffusing solution must become continuously weakened with the progress of the diffusion, so that in the later stages the diffusion would go on very slowly. Before any calculations therefore could be made, this would have to be taken into account, together with the possible swelling or contraction of the jelly, and if it were possible to apply the method quantitatively it would probably be better to employ larger quantities of the solution kept gently stirred and replaced by new solution before sensible change had taken place in the concentration. Both solutions of the normal salts and others rendered basic with definite additions of sodium carbonate were employed, and one of the most striking facts observed was that the rate of diffusion and the apparent amount of hydrolysed acid was in the case of chrome chloride unaffected by these conditions, and the differences scarcely if at all exceeded that of probable experimental errors, while with the chrome alum, the diffusion of the chromium was rendered much slower, but without any corresponding influence on that of the acid. From a solution of chrome alum rendered green by boiling, the diffusion of acid was much more marked than from the violet normal salt, supporting the view that the change of colour was due to hydrolysis and the formation of a basic salt. As has been noted, the solution of chromium chloride employed was materially stronger than that of the chrome alum, and perhaps this may explain the differences of effect. A further experiment is in progress with solutions of equal chromium concentration.

The rate of diffusion was found to be quite independent of the bore of the tube.

An interesting effect noticed in some of the experiments both with chromium chloride and chrome alum was the production of striæ or layers of green parallel to the surface and of greater intensity than the layers above and below. These recall the somewhat similar effects observed in the diffusion of bichromate in gelatine containing traces of silver nitrate, or conversely of silver nitrate in bichromated gelatine. The latter has been recently investigated by R. E. Liesegang (*Kolloide Z.*, 1907, 2, 70), who finds that it is much influenced by the presence of gelatines or decomposed gelatine. Ostwald has explained the phenomenon as due to the existence of a supersaturated solution of silver chromate which diffuses without precipitation to a certain concentration at which "germs" are spontaneously formed, and the concentration falls to saturation, and again diffuses till it again becomes sufficiently supersaturated. Liesegang points out that the gelatines increase the solubility of silver chromate. Although no two salts which mutually give rise to a less soluble one are present in the green chrome solutions, the explanation is probably somewhat similar. The hydrolytic dissociation and diffusion of the acid makes the salt continually more basic until at last a part becomes incapable of further diffusion, and possibly acts as a semipermeable membrane to the more basic part, while the more acid or normal portion diffuses further until it in turn becomes too basic. It is also possible that the basic salt passes spontaneously from the sol to the gel condition at a certain degree of basicity, leaving a more acid salt in solution, as it is well known that when separation takes place in such basic solutions, the portion unprecipitated is much more acid than before, the gel formation being only reversible in presence of considerable excess of acid.

The phenomena in the case of iron and aluminium salts are very similar in character to those just described, the diffusion of the acid always considerably preceding that of the base. In the case of ferric chloride, the salt fixed is of the deep brown characteristic of basic ferric salts. With alumina it is of course colourless, but may be made visible by the addition of a trace of yellow logwood infusion with which alumina forms a violet lake.

The experiments described are not only interesting as demonstrating in a striking way the hydrolysis of such salts, but also illustrate what has long been taught by one of us, and has recently been fully proved by Stiasny (*Collegium*, 1908, 337; *this J.*, 1908, 1030), that the acid and the colloidal base are absorbed independently by the amphoteric gelatine or gelatigenous hide-fibre, and that either may be absorbed in excess according to the conditions of the experiment.

Diffusion of Chrome Chloride in Gelatine.

Basicity of chromium chloride solution. 10 c.c. 10 per cent. $\text{CrCl}_3\cdot 6\text{OH}_2$.	19 hours.		67 hours.		91 hours.		115 hours.	
	Chrome.	Acid.	Chrome.	Acid.	Chrome.	Acid.	Chrome.	Acid.
About 1.4 per cent. chromium								
Normal salt	1.8	2.1	3.1	3.5	3.0	4.0	4.2	4.6
+1.3 c.c. $N/1 \text{ Na}_2\text{CO}_3$	1.7	2.0	3.1	3.4	3.0	4.0	4.2	4.6
+2.0 c.c. $N/1 \text{ Na}_2\text{CO}_3$	1.7	2.0	3.1	3.4	3.0	4.0	4.1	4.4
+5.7 c.c. $N/1 \text{ Na}_2\text{CO}_3$	1.7	1.9	3.1	3.5	3.0	4.0	4.1	4.5
As basic as possible	1.0	2.1	3.0	3.6	3.5	4.1	4.1	4.7

Basicity of chromium chloride solution. 10 c.c. 10 per cent. $\text{CrCl}_3\cdot 6\text{OH}_2$.	139 hours.		163 hours.		17 days.		—
	Chrome.	Acid.	Chrome.	Acid.	Chrome.	Acid.	—
About 1.4 per cent. chromium							
Normal salt	4.0	5.0	5.0	5.4	7.0	—	—
+1.3 c.c. $N/1 \text{ Na}_2\text{CO}_3$	4.0	5.0	5.0	5.4	7.0	—	—
+2.0 c.c. $N/1 \text{ Na}_2\text{CO}_3$	4.5	4.9	4.9	5.3	7.6	—	—
+5.7 c.c. $N/1 \text{ Na}_2\text{CO}_3$	4.5	5.0	4.9	5.4	7.3	—	—
As basic as possible	4.5	5.1	4.9	5.5	—	—	—

Diffusion of Chrome Alum in Gelatine.

Basicity of chrome alum solution. About 1 per cent. chromium 1/2 saturated chrome alum (about 5 per cent.).	19 hours.		67 hours.		91 hours.		115 hours.	
	Chrome.	Acid.	Chrome.	Acid.	Chrome.	Acid.	Chrome.	Acid.
Normal salt	1.1	1.2	1.0	2.1	2.2	2.5	2.6	3.0
+1 c.c. N/1 sodium carbonate	0.9	1.5	1.6	2.2	2.2	2.6	2.3	2.9
+2 c.c. N/1 sodium carbonate	0.8	1.9	1.3	2.4	1.7	2.8	1.9	3.1
As basic as possible	0.7	1.7	1.2	2.3	1.6	2.7	1.7	3.5

Basicity of chrome alum solution. About 1 per cent. chromium 1/2 saturated chrome alum (about 5 per cent.).	139 hours.		163 hours.		17 days.		—	
	Chrome.	Acid.	Chrome.	Acid.	Chrome.	Acid.	—	
Normal salt	2.9	3.3	3.1	3.5	4.7	5.3	—	
+1 c.c. N/1 sodium carbonate	2.5	3.1	2.7	3.4	4.1	5.0	—	
+2 c.c. N/1 sodium carbonate	2.0	3.4	2.1	3.6	3.0	4.0	—	
As basic as possible	1.8	3.3	1.9	3.4	2.5	4.7	—	

Journal and Patent Literature.

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I.—PLANT, APPARATUS, AND MACHINERY.

PATENTS.

Removal of liquid from solid materials; Apparatus for the —. P. J. Ogle, London. From F. St. Q. Cockburn, Traag, Norway. Eng. Pat. 2815, Feb. 7, 1908.

THE material to be filtered is fed continuously from a hopper which rotates over a horizontal, annular filter. The latter is supported over a vacuum chamber and the liquid is sucked through, leaving the solids on the surface of the filter. Immediately in front of, and attached to, the rotating hopper is a curved skimming blade which strips off the cake of solids from the filter. The place of the removed solids is at once taken by fresh material from the hopper, so that the vacuum is not "broken" and the process is continuous. The space below the filter is divided by radial partitions into sections, each connected to a double vacuum receiver. Washing liquid is sprayed on to the surface of the deposit by a rotating arm which follows the feed-hopper at a determined distance. The filtrate and wash-water passing through the filter are directed into one or other of the double vacuum receivers by a butterfly valve operated by the rotating frame which carries the skimmer, feed-hopper, and wash-water pipe.—W. H. C.

Pressure-filters; Plate for —. C. W. Merrill, Lead, S.D. U.S. Pat. 912,867, Feb. 16, 1909.

THE claim is for a filter-plate having a solid central web, the surface of which is corrugated. The corrugations are arranged in such a manner that they form concentric polygons. The sides of the polygons are intersected by drainage grooves, each of which is shorter than the shortest interior surface dimension of the filter-plate.—W. H. C.

Filtration and purification of gases and vapours. G. F. Jaubert. Fr. Pat. 394,472, Dec. 5, 1907.

THE purifying material is contained in closed, cylindrical, metal casings or cartridges, the ends of which are made of thin material so that they may be easily perforated. The case or cartridge is placed between two adjustable tubular supports, each of which is provided with projecting

teeth so that when they are forced together to grip the cartridge, the teeth perforate the thin ends and allow the gas, which enters by one support and leaves by the other, to pass through the purifying material. The object of the arrangement is to prevent the deterioration of the purifying material when stored before use and to allow the introduction of the cartridge into the stream of gas without admitting any air.—W. H. C.

Packing for filter-press elements. L. Schargel. Ger. Pat. 206,711, March 13, 1908.

THE packing consists of a flat ring, *g*, of ebonite or other suitable material, shown in cross-section, in Figs. 1 and 2, on which are fastened rings, *a*, *b*, of rubber, of any suitable cross-section. The rubber ring, *a*, does not cover the whole width of *g*, but leaves a portion, *c*, free. In this portion cuts, *f*, are made at intervals as shown in Fig. 3, corresponding to pieces, *d*, on the filter-press elements, so that the packing can easily be put in place.—A. S.

Liquids which readily deteriorate [e.g., sugar juices]; Apparatus for the filtration of —. H. Hoppe. Ger. Pat. 206,408, April 13, 1906.

A NUMBER of small sand-filter boxes are connected to common inlet and outlet pipes, the connections between the boxes and the inlet pipe being of such a kind that they