whatever that may happen to mean in any particular case.

Each paper maker and pulp seller would be able to provide himself with similar standards to the official ones, and once knowing the percentage of bleach powder required to produce a colour represented by any one of the four standards could, by a glance at his colour standards, readily form an estimate of the value of any pulp as far as its bleaching qualities were concerned.

Following is the method employed in making the actual bleach test itself :—

Suggested standard bleaching test :—

Minimum quantity to be taken, 10 grms.

10 grms.—10 per cent. air dry pulp.

160 c.c. of water containing bleaching powder (35 per cent chlorine) equivalent to 12 per cent of bleaching powder on the pulp taken.

Temperature—100° F. Time of bleaching—2 hours.

We have used this test for some years, and find it can be suitably carried out by tearing the pulp into shreds by hand, throwing into a litre of water, agitating with a powerful egg beater made of brass, and fitted with teeth, until a uniform pulp is obtained. Throw the resultant pulp into a porcelain filter and exhaust with the water pump, finally squeezing by hand, leaving the pulp approx. 30 per cent. dry. Place in a suitable vessel which is standing in a water bath, and is at the temperature of the bath, i.e., 100° F. Take 100 c.c. of water at 105° F., add the requisite number of c.c. of bleach solution to give the required percentage, and pour on to the pulp. Stir well, and bleach for two hours at 100° F., stirring occasionally with the thermometer.

We find that with filtered mill solution at 4½° Tw. approximately 30 c.c. of bleach solution will be required. This is checked at the time of the experiment.

After the time has expired throw the bleached pulp upon the porcelain funnel, exhaust with the pump, wash, make the filtrate and washings to 2 litres and titrate an aliquot portion. Calculate the bleach consumed as percentage on the 10 per cent. air-dry pulp taken.

We use a calcium chloride bath, fitted with a steam coil, and are able to make a dozen tests side by side, but any arrangement that will provide a constant temperature of the water bath will answer quite as well.

Make suitable sheets of the pulp for reference, and it is important to note that these should be air dried.

By bleaching at 100° F. one is able to make a large number of tests in a short time, and with suitable apparatus to make a large proportion side by side.

DISCUSSION.

Mr. R. W. SINDALL said that the paper-maker found that the consumption of bleach varied from say 8 per cent. up to 25 per cent. of the weight of pulp used. It was therefore important to him to have some method by which the minimum of bleach required to produce a given colour should be readily estimated. Discordant results were often due to causes such as the method of extracting the bleaching powder and antiquated methods of treating the pulp. From his own experience he had found it necessary to correlate the actual consumption of the bleach with the colour produced, in order to find the lowest consumption of bleach at which the maximum colour was reached. He used the tintometer as standard of colour because it was the handiest instrument. He quite agreed that in the hands of an untrained man deplorable mistakes and disputes might occur, but in the hands of a trained observer the tintometer could be used for the purpose. By its aid, an independent observer had been able to place in the correct order a series of pulps bleached at 100° F. and at the ordinary temperature, with amounts of bleaching powder varying from 2 to 20 per cent.

Dr. E. K. RIDEAL said that in the standardisation of bleach pulp the actual acidity or alkalinity, as the case might be, of the bleach used, should be stated, because the bleaching power was considerably raised in presence of free acid.

Mr. GRANT HOOPER said that the suggested test struck him as leaving the essential point still to be decided.

He took it that at the end they had still to decide what degree of colour remained in the pulp. It seemed to him to be very much better to follow the line which Mr. Sindall had suggested, namely, to rely directly on the tintometer. In the use of that instrument for deciding the colour of such a substance as flour, he had found no difficulty, and Mr. Sindall's experience seemed to have been equally satisfactory. The authors had suggested that the use of the tintometer by the practical man was a difficulty, but there were many trained persons incapable of deciding finer shades of colour. Would the amount of bleach used invariably indicate the degree of whiteness, and if not, was it not better and more direct to rely on the tintometer in the first instance?

Mr. BAKER, in reply, said that the alkalinity of the bleach solution used should not be overlooked in fixing the details of the standard test. The effect of free lime was to retard the operation. He believed that Cross and Bovan had dealt with that subject very thoroughly in a paper called "Some Considerations of the Chemistry of Hypochlorite Bleaching." With regard to the question of colour, the difficulty was not one of fine differences, but of very marked differences. They had found in practice that under the conditions of the standard test all pulps sold as bleaching pulps fell within the range of the proposed standards. The trials exhibited, which represented a large number of pulps, had been roughly classified into four classes, which might form a basis for fixing four colour standards. There was a wide difference between the highest and the lowest colour. As regards the colour measurement, he was afraid if they put before the business head of a concern a series of tintometer readings, it would not be very convincing, but if they could put before him some definite colour values representing the colour obtained by stated percentages of bleach consumption, he would readily make up his mind. It was certainly their intention to state the percentage of bleaching powder as well as the colour.

A TABLE OF SPECIFIC GRAVITIES OF SPIRITS CORRESPONDING TO INDICATIONS OF GLASS HYDROMETERS FOR USE WITH BEDFORD'S CORRECTED SIKES' TABLES.

BY JITENDRA NATH RAKSHIT AND SACHINDRA NATH SINHA, M.A.

Bedford, in his "Corrected Sikes's Tables" for ascertaining the strength of spirits with glass hydrometers (see this J., 1913, 1172), reproduces the specific gravity table (see page 130) from Sikes' original tables, which was meant for use with brass hydrometers. But he has not made it quite distinct in his book how far the results obtained are affected (1) by the use of tables meant for brass instruments, with those of glass, and (2) by the application of what was meant to be true strengths on the basis of Ure's experimental determinations of spirit strengths relative to those of Otto Hehner's, which formed the basis of the corrected Sikes' tables for glass hydrometers.

A table for this purpose is readily prepared in the following way. Taking any indication, e.g., 86.2°, the corresponding spirit strength found from Bedford's table at 60° F. is 41.50 per cent. proof spirit. By Hehner's table (Analyst, vol. 5.) the specific gravity for a spirit containing 41.5 per cent. proof spirit is 0.9724. Hence 86.2° indication by glass hydrometer represents 0.9724 specific gravity, whereas that from Table I. of Bedford is 0.9726. The table thus constructed gives the specific gravities of spirits at 60° F. compared with water at 60° F. for an indication at 60° F., and the reverse.

Again, if a specific gravity determined at another temperature by glass pyknometer, which is, in fact, an apparent gravity, is referred to this table, an apparent indication is also obtained. Next by the use of Bedford's corrected table for the above apparent indication true spirit strength may be obtained. Thus the error due to the different temperature in pyknometrical determinations may be conveniently eliminated.

Divs. on stem A.	Sp. gr.	Divs. on stem A.	Sp. gr.	Divs. on stem A.	Sp. gr.	Divs. on stem A.	Sp. gr.
7-0	0-7939	10-4	0-8004	13-8	0-8062	17-2	0-8117
7-2	0-7942	10-6	0-8009	14-0	0-8065	17-4	0-8119
7-4	0-7945	10-8	0-8012	14-2	0-8069	17-6	0-8122
7-6	0-7951	11-0	0-8015	14-4	0-8071	17-8	0-8124
7-8	0-7954	11-2	0-8017	14-6	0-8074	18-0	0-8128
8-0	0-7957	11-4	0-8022	14-8	0-8078	18-2	0-8130
8-2	0-7960	11-6	0-8025	15-0	0-8081	18-4	0-8133
8-4	0-7965	11-8	0-8028	15-2	0-8083	18-6	0-8135
8-6	0-7968	12-0	0-8031	15-4	0-8088	18-8	0-8139
8-8	0-7971	12-2	0-8036	15-6	0-8090	19-0	0-8141
9-0	0-7977	12-4	0-8039	15-8	0-8093	19-2	0-8143
9-2	0-7980	12-6	0-8041	16-0	0-8097	19-4	0-8148
9-4	0-7986	12-8	0-8046	16-2	0-8100	19-6	0-8150
9-6	0-7989	13-0	0-8049	16-4	0-8103	19-8	0-8152
9-8	0-7992	13-2	0-8052	16-6	0-8107	20-0	0-8156
10-0	0-7998	13-4	0-8057	16-8	0-8110		
10-2	0-8001	13-6	0-8059	17-0	0-8112		

Divs. on stem.	Sp. gr.	Divs. on stem.	Sp. gr.	Divs. on stem.	Sp. gr.	Divs. on stem.	Sp. gr.
0-0	0-8156	14-0	0-8390	28-0	0-8633	42-0	0-8883
0-2	0-8159	14-2	0-8392	28-2	0-8638	42-2	0-8887
0-4	0-8161	14-4	0-8396	28-4	0-8641	42-4	0-8891
0-6	0-8165	14-6	0-8400	28-6	0-8644	42-6	0-8895
0-8	0-8167	14-8	0-8404	28-8	0-8647	42-8	0-8898
1-0	0-8169	15-0	0-8407	29-0	0-8652	43-0	0-8902
1-2	0-8174	15-2	0-8411	29-2	0-8655	43-2	0-8906
1-4	0-8176	15-4	0-8413	29-4	0-8658	43-4	0-8910
1-6	0-8180	15-6	0-8417	29-6	0-8662	43-6	0-8913
1-8	0-8183	15-8	0-8421	29-8	0-8665	43-8	0-8917
2-0	0-8187	16-0	0-8424	30-0	0-8668	44-0	0-8922
2-2	0-8190	16-2	0-8428	30-2	0-8673	44-2	0-8925
2-4	0-8194	16-4	0-8432	30-4	0-8676	44-4	0-8928
2-6	0-8196	16-6	0-8434	30-6	0-8679	44-6	0-8932
2-8	0-8201	16-8	0-8437	30-8	0-8682	44-8	0-8935
3-0	0-8203	17-0	0-8441	31-0	0-8687	45-0	0-8939
3-2	0-8205	17-2	0-8444	31-2	0-8690	45-2	0-8942
3-4	0-8210	17-4	0-8448	31-4	0-8693	45-4	0-8945
3-6	0-8214	17-6	0-8451	31-6	0-8698	45-6	0-8949
3-8	0-8219	17-8	0-8455	31-8	0-8701	45-8	0-8952
4-0	0-8221	18-0	0-8458	32-0	0-8704	46-0	0-8956
4-2	0-8223	18-2	0-8462	32-2	0-8708	46-2	0-8961
4-4	0-8228	18-4	0-8465	32-4	0-8711	46-4	0-8965
4-6	0-8232	18-6	0-8469	32-6	0-8714	46-6	0-8968
4-8	0-8234	18-8	0-8472	32-8	0-8719	46-8	0-8970
5-0	0-8238	19-0	0-8477	33-0	0-8722	47-0	0-8974
5-2	0-8240	19-2	0-8480	33-2	0-8725	47-2	0-8978
5-4	0-8244	19-4	0-8483	33-4	0-8728	47-4	0-8982
5-6	0-8248	19-6	0-8486	33-6	0-8733	47-6	0-8986
5-8	0-8252	19-8	0-8490	33-8	0-8736	47-8	0-8990
6-0	0-8254	20-0	0-8494	34-0	0-8739	48-0	0-8994
6-2	0-8257	20-2	0-8497	34-2	0-8744	48-2	0-8998
6-4	0-8261	20-4	0-8501	34-4	0-8747	48-4	0-9000
6-6	0-8263	20-6	0-8504	34-6	0-8751	48-6	0-9005
6-8	0-8267	20-8	0-8508	34-8	0-8754	48-8	0-9007
7-0	0-8270	21-0	0-8511	35-0	0-8757	49-0	0-9012
7-2	0-8274	21-2	0-8515	35-2	0-8762	49-2	0-9016
7-4	0-8278	21-4	0-8518	35-4	0-8765	49-4	0-9020
7-6	0-8280	21-6	0-8522	35-6	0-8768	49-6	0-9025
7-8	0-8284	21-8	0-8525	35-8	0-8771	49-8	0-9027
8-0	0-8288	22-0	0-8529	36-0	0-8776	50-0	0-9030
8-2	0-8292	22-2	0-8532	36-2	0-8779	50-2	0-9034
8-4	0-8294	22-4	0-8535	36-4	0-8782	50-4	0-9038
8-6	0-8297	22-6	0-8538	36-6	0-8786	50-6	0-9042
8-8	0-8301	22-8	0-8542	36-8	0-8789	50-8	0-9045
9-0	0-8305	23-0	0-8545	37-0	0-8794	51-0	0-9048
9-2	0-8307	23-2	0-8550	37-2	0-8798	51-2	0-9051
9-4	0-8311	23-4	0-8553	37-4	0-8801	51-4	0-9054
9-6	0-8315	23-6	0-8556	37-6	0-8805	51-6	0-9058
9-8	0-8319	23-8	0-8560	37-8	0-8808	51-8	0-9062
10-0	0-8321	24-0	0-8563	38-0	0-8811	52-0	0-9066
10-2	0-8325	24-2	0-8566	38-2	0-8815	52-2	0-9069
10-4	0-8329	24-4	0-8571	38-4	0-8818	52-4	0-9072
10-6	0-8332	24-6	0-8574	38-6	0-8823	52-6	0-9076
10-8	0-8336	24-8	0-8577	38-8	0-8826	52-8	0-9080
11-0	0-8338	25-0	0-8581	39-0	0-8830	53-0	0-9084
11-2	0-8342	25-2	0-8585	39-2	0-8833	53-2	0-9087
11-4	0-8346	25-4	0-8588	39-4	0-8836	53-4	0-9091
11-6	0-8348	25-6	0-8592	39-6	0-8841	53-6	0-9095
11-8	0-8352	25-8	0-8595	39-8	0-8844	53-8	0-9099
12-0	0-8355	26-0	0-8599	40-0	0-8848	54-0	0-9103
12-2	0-8359	26-2	0-8602	40-2	0-8852	54-2	0-9107
12-4	0-8363	26-4	0-8605	40-4	0-8855	54-4	0-9111
12-6	0-8367	26-6	0-8609	40-6	0-8859	54-6	0-9115
12-8	0-8370	26-8	0-8612	40-8	0-8862	54-8	0-9118
13-0	0-8374	27-0	0-8615	41-0	0-8866	55-0	0-9122
13-2	0-8376	27-2	0-8618	41-2	0-8870	55-2	0-9126
13-4	0-8379	27-4	0-8622	41-4	0-8873	55-4	0-9130
13-6	0-8383	27-6	0-8627	41-6	0-8876	55-6	0-9133
13-8	0-8387	27-8	0-8630	41-8	0-8880	55-8	0-9137

Divs. on stem.	Sp. gr.	Divs. on stem.	Sp. gr.	Divs. on stem.	Sp. gr.	Divs. on stem.	Sp. gr.
56-0	0-9141	67-0	0-9351	78-0	0-9563	89-0	0-9779
56-2	0-9146	67-2	0-9354	78-2	0-9567	89-2	0-9783
56-4	0-9150	67-4	0-9359	78-4	0-9571	89-4	0-9786
56-6	0-9153	67-6	0-9362	78-6	0-9575	89-6	0-9792
56-8	0-9157	67-8	0-9366	78-8	0-9579	89-8	0-9794
57-0	0-9161	68-0	0-9369	79-0	0-9583	90-0	0-9798
57-2	0-9164	68-2	0-9374	79-2	0-9586	90-2	0-9802
57-4	0-9168	68-4	0-9378	79-4	0-9590	90-4	0-9806
57-6	0-9172	68-6	0-9381	79-6	0-9594	90-6	0-9811
57-8	0-9176	68-8	0-9384	79-8	0-9598	90-8	0-9815
58-0	0-9180	69-0	0-9388	80-0	0-9602	91-0	0-9819
58-2	0-9184	69-2	0-9393	80-2	0-9608	91-2	0-9823
58-4	0-9187	69-4	0-9397	80-4	0-9610	91-4	0-9827
58-6	0-9191	69-6	0-9400	80-6	0-9613	91-6	0-9831
58-8	0-9194	69-8	0-9403	80-8	0-9617	91-8	0-9834
59-0	0-9198	70-0	0-9407	81-0	0-9621	92-0	0-9839
59-2	0-9202	70-2	0-9411	81-2	0-9626	92-2	0-9842
59-4	0-9206	70-4	0-9416	81-4	0-9629	92-4	0-9846
59-6	0-9210	70-6	0-9419	81-6	0-9633	92-6	0-9850
59-8	0-9213	70-8	0-9422	81-8	0-9637	92-8	0-9854
60-0	0-9217	71-0	0-9426	82-0	0-9642	93-0	0-9859
60-2	0-9221	71-2	0-9430	82-2	0-9646	93-2	0-9863
60-4	0-9224	71-4	0-9433	82-4	0-9650	93-4	0-9867
60-6	0-9228	71-6	0-9437	82-6	0-9654	93-6	0-9871
60-8	0-9232	71-8	0-9441	82-8	0-9657	93-8	0-9874
61-0	0-9235	72-0	0-9445	83-0	0-9661	94-0	0-9878
61-2	0-9239	72-2	0-9448	83-2	0-9665	94-2	0-9882
61-4	0-9243	72-4	0-9452	83-4	0-9669	94-4	0-9886
61-6	0-9246	72-6	0-9456	83-6	0-9673	94-6	0-9890
61-8	0-9250	72-8	0-9459	83-8	0-9676	94-8	0-9894
62-0	0-9255	73-0	0-9463	84-0	0-9680	95-0	0-9898
62-2	0-9258	73-2	0-9467	84-2	0-9684	95-2	0-9900
62-4	0-9262	73-4	0-9471	84-4	0-9688	95-4	0-9907
62-6	0-9266	73-6	0-9475	84-6	0-9693	95-6	0-9911
62-8	0-9269	73-8	0-9479	84-8	0-9696	95-8	0-9915
63-0	0-9273	74-0	0-9483	85-0	0-9700	96-0	0-9919
63-2	0-9278	74-2	0-9487	85-2	0-9704	96-2	0-9924
63-4	0-9281	74-4	0-9491	85-4	0-9708	96-4	0-9928
63-6	0-9285	74-6	0-9496	85-6	0-9712	96-6	0-9933
63-8	0-9289	74-8	0-9500	85-8	0-9716	96-8	0-9937
64-0	0-9292	75-0	0-9504	86-0	0-9720	97-0	0-9941
64-2	0-9297	75-2	0-9509	86-2	0-9724	97-2	0-9945
64-4	0-9300	75-4	0-9513	86-4	0-9727	97-4	0-9949
64-6	0-9304	75-6	0-9516	86-6	0-9732	97-6	0-9953
64-8	0-9308	75-8	0-9520	86-8	0-9735	97-8	0-9958
65-0	0-9311	76-0	0-9523	87-0	0-9739	98-0	0-9962
65-2	0-9315	76-2	0-9527	87-2	0-9743	98-2	0-9966
65-4	0-9319	76-4	0-9531	87-4	0-9748	98-4	0-9970
65-6	0-9323	76-6	0-9535	87-6	0-9752	98-6	0-9974
65-8	0-9327	76-8	0-9539	87-8	0-9756	98-8	0-9979
66-0	0-9331	77-0	0-9543	88-0	0-9760	99-0	0-9983
66-2	0-9334	77-2	0-9547	88-2	0-9764	99-2	0-9987
66-4	0-9339	77-4	0-9551	88-4	0-9768	99-4	0-9991
66-6	0-9342	77-6	0-9555	88-6	0-9771	99-6	0-9996</