TEMPORARY AND PERMANENT DISABILITY RESERVES.

BY

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The movement to increase the percentage of earned premiums charged as the claim reserve under workmen's compensation policies from 55 per cent. to 60 per cent. immediately and to 65 per cent. two years from December, 1916, at latest indicates, perhaps, anew the utter unsuitability of this method and the improbability, amounting indeed to impossibility that it will assure solvency, even though these reserves are held.

It may be well, in consequence, to consider in what manner this troublesome question may otherwise be dealt with and especially in what manner it has been successfully dealt with, elsewhere.

Our debt to the State Insurance Fund (Rijksverzekeringsbank) of Holland is already great, since it has supplied us the data by means of which to compute the value of annuities terminable upon remarriage. It again lays us under obligation, however, by supplying a basis for setting up reserves prior to the determination of how the disabled workmen will emerge, i. e., restored, permanently totally disabled, permanently partially disabled or dying in consequence of the accident. Before hitting upon this method the managers of the Fund made, as they put it, "several attempts at a general and direct solution of the problem, all of which proved unsuccessful"; in consequence of which the following course has been adopted.

As regards payments under disabilities less than one month old, the aggregate to be paid for the first month is usually known before the valuation is in fact made and the number who will have been disabled more than one month is known, together with the number of months elapsed and the amount per diem of the disability benefits. These for purposes of the valuation are listed as follows:

These are the present values, according to the experience of the State Insurance Fund, taking into account all the financial contingencies, e. g., recovery, partial or total permanent disability, or death as a result of the accident.

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Months Since Accident.	Number Still Entitled.	Aggregate per Diem.	Reserve per $1.00 per Diem.	Total Reserve.
1–2	....	....	464.00	....
2–3	....	....	957.00	....
3–4	....	....	1,322.00	....
4–5	....	....	1,624,00	....
5–6	....	....	1,876.00	....
6–7	....	....	2,093.00	....
7–8	....	....	2,286.00	....
8–9	....	....	2,451.00	....
9–10	....	....	2,589.00	....
10–11	....	....	2,708.00	....
11–12	....	....	2,814.00	....
12–13	....	....	2,906.00	....
13–14	....	....	2,988.00	....
14–15	....	....	3,063.00	....
15–16	....	....	3,134.00	....
16–17	....	....	3,199.00	....
17–18	....	....	3,261.00	....
18–19	....	....	3,317.00	....
19–20	....	....	3,367.00	....
20–21	....	....	3,410.00	....
21–22	....	....	3,445.00	....
22–23	....	....	3,472.00	....
23–24	....	....	3,502.00	....
24–25	....	....	3,529.00	....
25–26	....	....	3,559.00	....
26–27	....	....	3,590.00	....
27–28	....	....	3,621.00	....
28–29	....	....	3,641.00	....
29–30	....	....	3,655.00	....
30–31	....	....	3,663.00	....
31–32	....	....	3,666.00	....
32–33	....	....	3,671.00	....
33–34	....	....	3,678.00	....
34–35	....	....	3,688.00	....
35–36	....	....	3,705.00	....
36–37	....	....	3,724.00	....
37–38	....	....	3,747.00	....

The law of Holland provides for benefits to dependents nearly the same as under the New York Law and also for the payment of total disability benefits during total disability but not for the fixed term payments for certain forms of partial disability. On the whole, however, these figures might serve for New York business, in case the experience as to recovery, emergence into partial or into total permanent disability or death would be the same or very nearly the same here as in Holland. It should not widely differ.

From the cases so valued in Holland, however, all cases which have meanwhile been determined by the medical officers to be permanently disabled, either totally or partially, are eliminated and separately valued by means of annuities. The rule is so to classify

VALUES OF u_{x+s}, s.

X.	μ_x, 0.	μ_{x+1}, 1.	μ_{x+2}, 2.	μ_{x+3}, 3.	μ_{x+4}, 4.	μ_{x+5}, 5.	μ_{x+6}, 6.	μ_{x+7}, 7.	μ_{x+8}, 8.	μ_{x+9}, 9.	μ_{x+10}, 10.	μ_{x+11}, 11.
10	.9826	.9657	.9456	.9714	.9791	.9822	.9840	.9858	.9883	.9906	.9927	.9947
11	.9822	.9650	.9446	.9706	.9784	.9816	.9836	.9855	.9880	.9904	.9926	.9947
12	.9819	.9642	.9437	.9698	.9777	.9810	.9832	.9853	.9878	.9901	.9925	.9946
13	.9816	.9634	.9428	.9690	.9770	.9805	.9829	.9852	.9876	.9900	.9923	.9946
14	.9812	.9626	.9420	.9682	.9764	.9801	.9826	.9850	.9874	.9898	.9923	.9945
15	.9808	.9620	.9412	.9675	.9758	.9796	.9823	.9848	.9873	.9897	.9921	.9944
16	.9806	.9614	.9404	.9668	.9753	.9792	.9820	.9847	.9871	.9895	.9921	.9944
17	.9803	.9608	.9396	.9661	.9747	.9787	.9818	.9845	.9870	.9894	.9919	.9943
18	.9800	.9602	.9390	.9655	.9742	.9783	.9815	.9844	.9869	.9893	.9918	.9942
19	.9797	.9597	.9383	.9648	.9737	.9780	.9812	.9842	.9867	.9891	.9917	.9942
20	.9795	.9592	.9377	.9643	.9732	.9777	.9810	.9841	.9866	.9891	.9916	.9941
21	.9793	.9588	.9371	.9638	.9728	.9775	.9808	.9840	.9865	.9890	.9915	.9940
22	.9791	.9584	.9366	.9633	.9723	.9772	.9806	.9838	.9864	.9889	.9914	.9938
23	.9789	.9580	.9360	.9629	.9719	.9769	.9805	.9837	.9862	.9888	.9912	.9937
24	.9787	.9576	.9355	.9624	.9715	.9767	.9803	.9835	.9860	.9887	.9910	.9936
25	.9785	.9573	.9351	.9620	.9712	.9766	.9802	.9834	.9858	.9885	.9911	.9934
26	.9783	.9571	.9348	.9616	.9710	.9765	.9801	.9833	.9856	.9885	.9910	.9933
27	.9782	.9568	.9345	.9612	.9706	.9764	.9800	.9831	.9856	.9884	.9908	.9931
28	.9780	.9566	.9342	.9609	.9704	.9763	.9798	.9830	.9856	.9882	.9907	.9929
29	.9779	.9564	.9340	.9605	.9703	.9763	.9799	.9830	.9854	.9881	.9905	.9927
30	.9777	.9562	.9338	.9602	.9702	.9764	.9798	.9828	.9853	.9879	.9904	.9925
31	.9776	.9560	.9335	.9598	.9702	.9763	.9797	.9827	.9852	.9878	.9902	.9922
32	.9775	.9559	.9333	.9597	.9701	.9764	.9796	.9826	.9851	.9877	.9900	.9919
33	.9773	.9557	.9333	.9594	.9702	.9764	.9795	.9825	.9851	.9875	.9897	.9916
34	.9772	.9556	.9331	.9592	.9702	.9764	.9795	.9823	.9849	.9874	.9895	.9913
35	.9771	.9555	.9330	.9590	.9701	.9765	.9794	.9822	.9847	.9872	.9894	.9909
36	.9769	.9553	.9329	.9588	.9702	.9764	.9793	.9820	.9845	.9871	.9890	.9905
37	.9768	.9552	.9328	.9586	.9703	.9764	.9792	.9818	.9844	.9869	.9887	.9900
38	.9766	.9551	.9327	.9587	.9705	.9763	.9791	.9817	.9842	.9866	.9884	.9895
39	.9765	.9549	.9327	.9587	.9706	.9763	.9791	.9816	.9840	.9863	.9879	.9890
40	.9763	.9548	.9327	.9590	.9707	.9764	.9790	.9814	.9838	.9859	.9874	.9884
41	.9761	.9457	.9327	.9594	.9709	.9764	.9789	.9811	.9835	.9855	.9869	.9877
42	.9759	.9546	.9329	.9600	.9711	.9763	.9787	.9809	.9320	.9851	.9864	.9870
43	.9757	.9547	.9334	.9606	.9713	.9762	.9785	.9805	.9827	.9845	.9858	.9862
44	.9756	.9548	.9339	.9613	.9714	.9762	.9782	.9802	.9822	.9839	.9850	.9854
45	.9754	.9550	.9344	.9620	.9716	.9759	.9779	.9799	.9817	.9832	.9842	.9844
46	.9753	.9552	.9351	.9628	.9716	.9758	.9777	.9795	.9811	.9824	.9833	.9834
47	.9751	.9555	.9359	.9636	.9717	.9755	.9773	.9790	.9805	.9816	.9824	.9823
48	.9750	.9558	.9368	.9640	.9717	.9752	.9769	.9785	.9797	.9807	.9812	.9810
49	.9749	.9561	.9377	.9647	.9716	.9748	.9765	.9778	.9789	.9796	.9801	.9797
50	.9747	.9565	.9386	.9653	.9716	.9744	.9759	.9771	.9780	.9786	.9787	.9782
51	.9745	.9568	.9396	.9655	.9715	.9739	.9753	.9764	.9770	.9772	.9772	.9765
52	.9743	.9572	.9406	.9657	.9711	.9733	.9746	.9755	.9758	.9759	.9757	.9747
53	.9741	.9575	.9416	.9659	.9707	.9727	.9738	.9743	.9746	.9744	.9739	.9728
54	.9738	.9578	.9424	.9659	.9702	.9702	.9719	.9727	.9732	.9728	.9720	.9706

VALUES OF $u_{x+\theta}$, s.

x.	$\mu_{x,0}$	$\mu_{x+1,1}$	$\mu_{x+2,2}$	$\mu_{x+3,3}$	$\mu_{x+4,4}$	$\mu_{x+5,5}$	$\mu_{x+6,6}$	$\mu_{x+7,7}$	$\mu_{x+8,8}$	$\mu_{x+9,9}$	$\mu_{x+10,10}$	$\mu_{x+11,11}$
55	.9734	.9580	.9433	.9658	.9697	.9708	.9716	.9719	.9717	.9710	.9699	.9682
56	.9729	.9581	.9440	.9656	.9688	.9699	.9704	.9705	.9699	.9689	.9676	.9657
57	.9724	.9582	.9448	.9651	.9679	.9687	.9690	.9689	.9680	.9668	.9651	.9628
58	.9718	.9582	.9454	.9645	.9668	.9673	.9675	.9669	.9658	.9644	.9624	.9597
59	.9711	.9581	.9461	.9637	.9657	.9658	.9655	.9648	.9635	.9617	.9593	.9564
60	.9703	.9580	.9465	.9627	.9643	.9640	.9636	.9625	.9609	.9588	.9559	.9527
61	.9694	.9576	.9468	.9616	.9627	.9622	.9614	.9600	.9580	.9554	.9523	.9486
62	.9683	.9571	.9470	.9601	.9608	.9600	.9589	.9572	.9548	.9519	.9483	.9442
63	.9671	.9565	.9468	.9585	.9587	.9577	.9562	.9540	.9513	.9480	.9440	.9394
64	.9657	.9556	.9464	.9567	.9565	.9551	.9532	.9507	.9476	.9437	.9493	.9341
65	.9641	.9545	.9458	.9546	.9540	.9522	.9500	.9470	.9433	.9390	.9340	.9284
66	.9623	.9531	.9448	.9523	.9511	.9490	.9465	.9429	.9387	.9339	.9284	.9221
67	.9602	.9515	.9435	.9495	.9479	.9455	.9425	.9384	.9337	.9283	.9221	.9153
68	.9579	.9495	.9418	.9465	.9445	.9415	.9380	.9333	.9280	.9220	.9153	.9078
69	.9553	.9472	.9399	.9432	.9406	.9372	.9329	.9277	.9219	.9153	.9078	.8997
70	.9524	.9446	.9376	.9395	.9364	.9323	.9275	.9216	.9151	.9078	.8997	.8909
71	.9492	.9417	.9349	.9354	.9318	.9270	.9214	.9150	.9078	.8997	.8909	.8813
72	.9456	.9383	.9316	.9309	.9266	.9212	.9149	.9078	.8997	.8909	.8813	.8710
73	.9417	.9345	.9280	.9259	.9208	.9147	.9077	.8997	.8909	.8813	.8710	.8597
74	.9373	.9302	.9238	.9204	.9146	.9076	.8997	.8909	.8813	.8710	.8597	.8475
75	.9324	.9255	.9190	.9143	.9076	.8997	.8909	.8813	.8710	.8597	.8475	.8343
76	.9271	.9201	.9134	.9074	.8997	.8909	.8813	.8710	.8597	.8475	.8343	.8201
77	.9212	.9141	.9070	.8997	.8909	.8813	.8710	.8597	.8475	.8343	.8201	.8042
78	.9147	.9073	.8997	.8909	.8813	.8710	.8597	.8475	.8343	.8201	.8042	.7865
79	.9076	.8997	.8909	.8813	.8710	.8597	.8475	.8343	.8201	.8042	.7865	.7675
80	.8997	.8909	.8813	.8710	.8597	.8475	.8343	.8201	.8042	.7865	.7675	.746
81	.8909	.8813	.8710	.8597	.8475	.8343	.8201	.8042	.7865	.7675	.746	.723
82	.8813	.8710	.8597	.8475	.8343	.8201	.8042	.7865	.7675	.746	.723	.697
83	.8710	.8597	.8475	.8343	.8201	.8042	.7865	.7675	.746	.723	.697	.671
84	.8597	.8475	.8343	.8201	.8042	.7865	.7675	.746	.723	.697	.671	.642
85	.8745	.8343	.8201	.8042	.7865	.7675	.746	.723	.697	.671	.642	.610
86	.8343	.8201	.8042	.7865	.7675	.746	.723	.697	.671	.642	.610	.576
87	.8201	.8042	.7865	.7675	.746	.723	.697	.671	.642	.610	.576	.53
88	.8042	.7865	.7675	.746	.723	.697	.671	.642	.610	.576	.53	.40
89	.7865	.7675	.746	.723	.697	.671	.642	.610	.576	.53	.40	.00
90	.7675	.746	.723	.697	.671	.642	.610	.576	.53	.40	.00	
91	.746	.723	.697	.671	.642	.610	.576	.53	.40	.00		
92	.723	.697	.671	.642	.610	.576	.53	.40	.00			
93	.697	.671	.642	.610	.576	.53	.40	.00				
94	.671	.642	.610	.576	.53	.40	.00					
95	.642	.610	.576	.53	.40	.00						
96	.610	.576	.53	.40	.00							
97	.576	.53	.40	.00								
98	.53	.40	.00									
99	.40	.00										
100	.00											

the case if " the medical officer declares that a change (increase or decrease) in the degree of incapacity is impossible within the lapse of a year."

All such cases are valued by an annuity table, so computed as to represent " the average rate of diminution of an annuity, first, by mortality among permanently disabled workmen, second by reactivity (i. e., recovery), third by decrease or increase of degree of incapacity." These factors have been provided for 11 years succeeding the injury and are, in practice, supplemented beyond that period by mortality factors only. Tables of values of annuities corresponding with these can readily be prepared, merging into the Danish Survivorship or any other suitable table after the lapse of the eleven years.

The preceding table presents the factors which the State Insurance. Fund of Holland uses for the computation of the value of total and permanent disabilities, taking into account all of the elements of risk. They are used in a manner similar to the probabilities of survival in computing ordinary annuity values.

When $S > 11$ the value of u_{x+s}, s may be found by means of the formula:

$$u_{x+s}, \; s = u_{(x+s-11)+11}, \; 11.$$