was to sell his holding, improvements and all, and that for his own absolute use. It was never, as far as I know, contended with respect to such holding that the landlord could fairly ask for increased rent in respect of improvements made before 1870, and subsequently enjoyed, on the ground that if the tenant had been claiming compensation from him under section 4 of the Act of 1870 (which he never did), the landlord could have insisted on having some abatement from the real value of these improvements because of the tenant's enjoyment of them."*

Of course the definition of the word "improvements" adopted by the court in Adams v. Dunseath, will apply to the fixing of a fair rent in the case of an Ulster custom holding as well as in the case of a holding under the ordinary law. The fact that the rule limiting the right to deduction from rent on account of improvements, which arises from the application of the compensation clause of the Act of 1870 to the fair rent sections of the Act of 1881, does not apply to Ulster custom holdings, however, makes a very important distinction in favour of such holdings. It excepts them from many disabilities that apply to tenancies not subject to the custom.

I have here endeavoured to give a short, and I will venture to hope, accurate account of the peculiar system of land tenure that prevails in the north of Ireland. I have briefly traced its origin, described its characteristics, and shown the position it holds under the existing Irish land laws. To this custom much of the progress and prosperity of the north of Ireland is attributed by its supporters, and, undoubtedly, the farmers holding under it are conspicuous for selfreliance, determination, and untiring industry.

III.—Our Present and Future Water Supply. By John A. Walker, J.P., late Chairman of the Waterworks Committee.

[Read Tuesday, 13th March, 1894.]

Public attention has been directed to the water supply to the city and townships during the past year more than has been the case since the foundation of the Vartry system.

It seemed to require some such event as the unexampled drought of 1893 to arouse the public mind from the state of lethargy into which it had fallen during the past quarter of a century. stant had been the Vartry service, so abundant in quantity, and so excellent in quality, that the inhabitants of the city and townships believed it was inexhaustible, and in that belief they were satisfied to rest content. But those who were behind the scenes, who had an opportunity of guaging the inflow and outflow at the Roundwood

* See also judgment of Chief Baron Palles.

[†] I have not in this paper referred to the usages similar to the Ulster Custom existing in other parts of Ireland, and which were legalized by section 2 of the Act of 1870, and an example of which is to be found on Lord Portsmouth's estate in Wexford. These customs merit separate treatment.

reservoir, who were acquainted with the constantly increasing demand made upon that basin both by the increased area supplied and the wasteful extravagance of consumers, had a different tale to tell. They knew that the Vartry was not an inexhaustible quantity; that under certain conditions it might fail altogether. The experience of last year showed this; the Corporation had received a warning in the year 1887, and this warning, one would have thought, should have led them to at once set about providing either additional storage, or if need were, a supplemental lake. They did neither. Not only were they culpable in this, but they were culpable also in not providing a second line of mains between Stillorgan and Roundwood. For years this subject was brought to their knowledge and urged upon them by Mr. Harty, the City Engineer, but year after year it was shelved, and not till last year was it finally settled and the work of laying the mains begun. Ever since the Gray reservoir at Stillorgan was completed, it has remained absolutely useless, the existing mains being unable to convey more water than was necessary to till the other two reservoirs, and as these contain only a fortnight's supply, if a burst in the mains had taken place requiring a month to repair, the city and townships would have been without water for half that time. have been living all along in a fool's paradise, and have not known

In the year 1887 the drought began in March, and continued till November. The water in the reservoir fell twenty-seven feet, and did not rise to its normal height till March in the following year. This was a sharp and severe experience, and should have led to prompt action; but the danger having passed, and the citizens being ignorant of the condition of things, the subject was allowed to slide till such time as another and more emphatic reminder was given, such as has taken place. The public this time having become alarmed the necessary machinery has been set in motion to do what should have been done years ago. For with a most unaccountable and inexplicable want of judgment the Waterworks Committee have been constantly increasing the number of their customers but not their storage capacity. The Roundwood reservoir was estimated by its founder to be sufficient to supply an area of twelve square miles, but the Corporation have increased the area to twenty-eight square miles, and added not one yard either to the catchment area or to the area for storage. They have been like a firm trading far beyond its capital, and when a crisis came had perforce to bow to the inevitable. But with the experience which they have had and the warnings that have been given, it would clearly be criminal now not to provide against any similar event in the future, especially as so many householders are at present whollydependent on the Vartry for all domestic purposes.

With these preliminary observations I shall proceed to state what the Vartry system is. I think it will be interesting to the public to know the pains which the Corporation have taken to furnish them with a pure and what ought to be an abundant supply of potable water.

It is not necessary that I should do more than refer to the history

of the Vartry scheme, because it is well known that to the able and distinguished services of the late Sir John Gray it was mainly due. But I cannot close my eyes to the fact that in his anxiety to obtain customers outside of the city proper, Sir John Gray entered into arrangements with some of the surrounding townships that were not conceived in the interest of the citizens of Dublin. They were not only loose in their conception but unjust in their conditions, and have proved to be a source of trouble and loss to the Corporation from

his day to ours. The VARTRY RESERVOIR is situated near the village of Roundwood, in County Wicklow, and is about twenty-six miles south of the City of Dublin. It is surrounded by a number of hills, some of them of considerable altitude. These hills form the watershed, and comprise about 14,080 acres. There are amongst them a number of springs and rivulets, but the principal supply comes from the river Vartry, which takes its rise in one of the hills about five miles to the north The reservoir itself has been formed by building of the reservoir. an embankment across a valley at Roundwood; on the top of this embankment the public road has been constructed. On the western side of the road is the reservoir, covering a space of 400 acres, having an altitude of 698 feet above Dublin, and on the eastern side are the filter beds, the lodge, and other premises belonging to the works, together with green swards and uplands, looking very much like a gentleman's domain. The whole is surrounded by a plantation of firs and pines which impart to the works an extremely charming and agreeable aspect, and would well repay a visit of anyone in search of the beautiful in nature combined with the useful in art.

When the reservoir is at its top water-level it contains 2,400,000,000 gallons of water, quite sufficient to furnish a four months' supply to the city and present townships, the quantity being estimated at, say, twenty gallons per head per day. The depth of the reservoir at its deepest part is sixty feet, and when the water rises above the top water-level it flows over a weir down a rocky defile and forms a series of beautiful cascades, reminding one of the Reuss, at Andermat, in Switzerland; it thence flows on to the harbour at From the deepest part of the reservoir rises a tower upon which is recorded the depth of the water at that point, and underneath which the water flows into a main passing through the embankment where there are ingenious arrangements for regulating and guaging the quantity permitted to flow into the filter beds. These beds are fifty-eight feet below the top water-level of the Before the water reaches the filter beds it flows into a basin and is thence distributed by two streams-one on their north and one on their south side. From these streams there are openings or sluices through which the water flows into the filters. ten beds having an average depth of ten feet; most of them have concreted sides. They are composed of two and a-half feet of fine sand, two feet of coarse gravel, and two feet of rough stones The water is let in on the top and percolates through the sand, and gravel, and stone, finding its way into a sluice from which it rises by gravitation and passes into the tanks, of which there are two, where it looks as clear as crystal, and shows how completely and perfectly the filters have done their work. The filter-beds are cleaned out at regular intervals, and the materials composing them is thoroughly washed before being put back, so that every care is taken to ensure as perfect and complete a process of filtration and purification as the skill of man, combined with experience, can devise.

The water thus filtered flows in regulated quantities into a tunnel two and three-quarter miles in length to a place called Callow-hill, where it passes over a weir into a basin, and is jocularly said to become aerated. The quantity passing over the weir is accurately regulated and tabulated. Thence it flows into the main which conveys it to the reservoirs at Stillorgan, being tapped en route to supply Bray and two or three smaller places. At Stillorgan there are three reservoirs, as before stated, but two only have hitherto been used; the third, or Gray reservoir, which is the larger of the three, will be used so soon as the second line of mains at present being laid between Stillorgan and Roundwood, has been completed. The capacity of the Stillorgan reservoirs in use is 180,000,000 gallons, and the height above low water level at the Dublin quay is 272 feet, so that there is ample pressure for all purposes in the city and for most purposes in the townships. Before the water from these reservoirs flows into the distributing mains, it has to pass through screens formed of the finest gauze wire, consequently no vegetable or other matter can possibly escape into the mains which convey it to the city and townships.

From the above description it will be seen that every care is taken to provide the public with a potable water of the highest class, and under ordinary circumstancs, with proper care, that supply should be equal to any demand made upon it. But in reference to this I have now to deal with a matter which seriously affects the supply and the inhabitants generally, and that is the question of waste.

The demand made upon the Vartry by the city and townships amounts to about 15,000,000 gallons per day (9,000,000 for the city and 6,000,000 for the townships), and it is estimated that at least one third of that is wasted. What the waste is in Dublin it is difficult to ascertain. The system of examination is, I am inclined to think, very defective. It depends upon the auricular sharpness of the inspectors in discovering at unearthly hours the sound of running water. It appears to me to be a very primitive system, and should, I think, give place to an automatic system of check, such, for instance, as the Deacon, which I understand can not only disclose the street but the house in which the waste is going on.

The mode of inspection referred to is open to many abuses, not the least of which are bribery and corruption, a temptation that men should hardly be exposed to.

In 1892 the Corporation of Dublin published an exhaustive report, prepared by Mr. J. J. O'Meara, who had visited most of the towns in England in which the Deacon system was in use. In this report it is clearly shown that wherever the Deacon check is applied

a considerable saving has been the result, in some cases to the extent of one-half, so that the annual saving thereby effected would far more than cover the cost of laying down and attending to the machines required to carry out the system. Were this or any other equally good arrangement for the prompt and accurate discovery of waste introduced into the city and townships, there would hardly be any necessity for an increase in the storage or other means of supply. The Roundwood reservoir would be ample, I believe, for all ordinary purposes.

That you may judge how great this waste is in the townships—and I do not hesitate to say the waste in the city, notwithstanding the activity of the inspectors, is quite as great in proportion—I shall give you a statement of the population of the various townships at the last census, the quantity of water they were entitled to receive under statute, the quantity they were using on the 26th of July last year (before steps were taken to curtail it), and the quantity they were using in September, after the Waterworks Committee had made a personal appeal to them to put an immediate stop to the waste that was going on.

Township,	Population.	Statutable quantity of 20 gals. per head per day.	26th July, '93.	Week ending 27th Sept., '93
Pembroke, Blackrock, Kilmainham, Clontarf, Kingstown, Bray, Dalkey, Killiney,	 24,269 8,401 6,519 5,104 17,352 6,888 3,197 2,649	485,380 168,020 130,380 102,080 347,040 137,760 63,940 52,980	717,715 336,857 166,714 177,143 783,571 370,000 160,286 71,286	556,428 227,143 138,572 142,857 368,571 276,143 96,857 51,428
		1,487,580	2,783,572	1,857,999

These reductions which were most creditable to the townships, and to Kingstown in particular, were made before the Waterworks Committee of the Corporation restricted the hours of supply, so that it may be fairly assumed that the inhabitants co-operated with the commissioners in checking waste, and that the amount used under these conditions was sufficient for all domestic and other purposes. But to continue to supply the townships with the quantity of water they were using in July, and previous to that date, meant that they were paying an average of only $1\frac{1}{2}$ d, per thousand gallons for what was costing the Corporation $2\frac{1}{2}$ d, or a net loss to the Corporation of a 1d. per thousand gallons, a state of things that no sane man would tolerate in his own business if he wished to keep out of the Bankruptcy Court, and what no body of commissioners should allow themselves to be parties to. The remedy for this is that the townships shall consent to pay a reasonable price for whatever water

they receive over and above the statutable quantity. Let them make the best bargain they can with the Water Works Committee; no one would have any right to find fault with them for that, and I am sure the Committee would meet them in a cordial and liberal spirit. It is a matter of business for business men to deal with, and should be conducted in a friendly and generous fashion in the interests of the public at large.

On the other hand if the townships refuse to do this, then the only alternative is a resort to an Act of Parliament an alternative that ought to be avoided if possible. Of course the Townships may combine to provide an independent supply for themselves, but the expense attending this would be very serious, and would involve them in an amount of litigation and opposition that prudent men should pause before embarking on so dangerous a sea of trouble.

If it can be shown that the Corporation can supply them with all the water they require, and can do that at a price lower than they can supply themselves by their proposed scheme, then, I think it would be most wise to negotiate with the Water Works Committee with a view to obtain the best terms possible, and as I have already said, I am sure the Water Works Committee will be found most willing to meet them on fair and reasonable grounds.

Our Future Supply.

It is by no means certain that the drought of last year may not occur again at a very short interval. It is not certain that the present year may not repeat last year's experience; meteorological prophets seem to have been at fault last year, they may be this. "To be forewarned is to be forearmed." So, with a view to be prepared for eventualities, several important schemes have been put forward. The first in order and importance is that proposed by the Waterworks Committee of the Corporation. They propose to embank Lough Dan and convey its water to the filter-beds at Roundwood. Lough Dan is a lake of considerable size and depth; I believe it covers an area of 260 acres, and is almost surrounded by hills which are altogether outside of the water-shed which feeds Roundwood, giving an additional catchment area of 15,000 acres. Thus far it would be an advantage, but on the other hand the water of this lake is of the most peaty description and in mass is perfectly brown, almost black, so that I question if any amount of filtration will all the been will clear it from this objectionable quality; besides, it has been used to used time out of mind for the purpose of sheep washing, and every stream flowing into it has been employed for a like purpose. also surrounded by lead and probably other minerals; hence, in addition addition to its colour, its quality of purity is of the most questionable to able kind. Of course a system of filtration would to some extent mitigate at. Of course a system of filtration would to some extent mitigate this, but whether it would completely remove it so as to place it place it on a level with the Vartry, is, to say the least of it, highly problematical. Then comes the question of outlay.

When it is borne in mind that Lough Dan is twenty-three feet below the Roundwood reservoir; that its water must be conveyed six or seven miles to the filter-beds, and that the riparian rights

of mill owners and others on the river which flows from the lake through the Vale of Avoca to Arklow must be maintained, it will be seen that the level of the lake would have to be raised considerably. Should this be found necessary, it will involve the construction of an embankment at the southern end of the lake, and will necessitate the purchase of all the land that would be submerged or otherwise affected by the higher level, as well as the purchase of the land through which the water would be conveyed to the filter-beds, with claims for compensation all round. To estimate what all this would amount to in cash is not easy, but it may safely be put down at £100,000 at the least.

Now the question is: Is this undertaking necessary? I respect-

fully say it is not.

The next scheme spoken about is one in which it is proposed to enlarge the storage in the valley of the Vartry through which the river flows into the Roundwood reservoir to about the size of that lake This would also involve the purchase of additional land, but not so much probably as in the Lough Dan scheme. When it is considered that in ordinary seasons ten to fifteen million gallons per day flow over the weir at Roundwood between the months of October and March following, it may be concluded that there would be sufficient to fill a supplemental reservoir of undoubtedly very considerable capacity. The scheme would be less expensive than the Lough Dan scheme; but the objection to it is, that it would be within the present Roundwood watershed, whereas Lough Dan is beyond it and would increase it by many thousand acres. it will be seen that the pros and cons are of grave importance, and will have to be carefully weighed before either scheme is decided on.

The third scheme proposed is that the townships consisting of Blackrock, Kingstown, Dalkey, and Bray, should combine and provide an independent supply for themselves, and to that extent relieve the strain upon the Vartry. I have already referred to this proposal and expressed my disapproval of it, and need not further touch upon it beyond stating that I consider there is no need for it, and because I think the Vartry can be made to supply all they want. The expense of carrying out such a plan would be a heavy fourden on the ratepayers of the districts, for they would have to face a very strong and costly opposition in Parliament, and out of it, from the Corporation of Dublin. For these reasons alone, I think the townships should pause before embarking on such an undertaking, however plausibly its advantages may have been placed before them.

The last proposal I have to refer to is one which has not been placed before the public in a concrete form, but which I respectfully submit is deserving of very serious attention. The proposal is that additional storage should be provided in the valley of the Vartry amounting to one-sixth that of the present reservoir. Most of the land is already in the possession of the Corporation. And to supplement this, that the Grand Canal should be used wherever and whenever possible for the south side of the city, even though the expense of laying special mains had to be incurred. Then as

pipes have been laid from the north side of the city, along the Royal Canal bank to the ninth lock, that sufficient land should be purchased there to enable filter-beds to be constructed, and thus the water of the Royal Canal could be employed in case of need to supply the north side of the city. I know not whether the water of this Canal, properly filtered, would be a good potable water. I have never seen it tested, nor have I seen any analysis of it, but if it be equal to the water of the Grand Canal it will be extremely pleasant to drink.

The Royal Canal is fed by Lough Owel, a lake about two miles beyond Mullingar, and I understand the Directors of the Midland Railway Company, who own it, are promoting a bill in Parliament to enable them to raise the level of that lake twelve inches; if they succeed in this they will have abundance of water to supply any

demand we shall ever be likely to make upon it..

I consider it is a pity not to utilize these two admirable water systems to supplement the Vartry, whenever we can do so with advantage to the public, and as the chief expense in connection with both has already been incurred, I am of opinion the Corporation should proceed to complete them, and thus place a water famine outside the region of possibility.

Finally, and to make certainty doubly sure, let the Corporation adopt the Deacon, or any other equally good system of automatic check, against waste, and let the townships do the same. It will be some expense at first, and will involve an annual cost to maintain, but it will in a short time of the life of the control of the life of the control of the life of the l

but it will, in a short time, pay for itself in the saving it will effect. Thus with the additional storage at Roundwood, should these proposals be adopted; with the two canals as auxiliaries, and the Deacon system employed as a check upon waste we should have such security against a recurrence of the annoyances, the anxieties and the troubles through which we had to pass last year, as would in itself be sufficient to fully justify the additional expenditure that may have to be incurred to carry them out.

IV.—Reply to Mr. Walker's paper—Our Present and Future Water Supply. By Spencer Harty, C.E.

[Read Tuesday, 13th March, 1894.]

I am pleased to see that the late Chairman of the Waterworks Committee is still taking such an earnest and anxious interest in the waterworks as to induce him to write so interesting a paper, and one which is provocative of so much discussion. He will, I am sure, accordingly pardon me if I differ with him on a great many of the salient points which he has raised, and also if I call attention to some inadvertent errors in his paper: the first of which is that the present Stillorgan reservoirs, upper and lower, contain a fortnight's supply. Unfortunately, they do not. At twelve million gallons

such be the case the use of a waste water meter will be no preventative. He further states that wherever the Deacon check is applied a considerable saving has been effected. I have no doubt whatever that this is a fact where no proper system of inspection previously existed, but in order to arrive at a fair comparison the system

in use before the adoption of the meter should be stated.

No doubt if an efficient and vigorous system of inspection were adopted in place of a lax or perhaps no inspection, the result must be a great saving in water, no matter whether a meter is used or not. In dealing with the question of waste or consumption of water in a city, the consideration of what is domestic water supply should be borne in mind. The authorities in England are much more rigorous in limiting the supply for domestic purposes than we are in Dublin, where large hotels are allowed to use water both for hotel purposes, lavatories, urinals, and even for steam engines, without any extra charge. Urinals and lavatories are now adjuncts to all well-regulated public houses, and yet no extra charge is made for water; very few of these houses pay extra for washing bottles, the large dining-rooms in the city pay nothing extra for the water consumed by them, offices and public buildings have immunities which are not recognised anywhere else. Photographers, who keep water running on negatives all night, are not metered. I could multiply many similar instances where water in Dublin is used for purposes not strictly domestic, and not being taken into account is put down as if it were waste water. These are the questions which should be closely considered in dealing with the subject in Dublin. Walker also states "that the waste in the city is as great as in the townships, notwithstanding the activity of the inspectors." when it is considered that the consumption in the townships has risen from forty to sixty-four gallons per head per day, and that at the same time the consumption for all purposes whatsoever in the city and extra municipal districts (not including the townships) at the worst period did not exceed thirty-four gallons per head per day, this statement immediately falls to the ground.

I wish to call attention to the fact that Dublin is a water closetted city, and that wherever water closets are used the consumption of water is increased from six to twelve gallons per head per day. Many of the towns in England, if practically not all, where the waste water meter system is in use, have only a small percentage of water-closets, hence a less consumption per head per day. been found impossible in Glasgow, notwithstanding seventy-seven metered districts, to reduce the consumption for domestic purposes to to a less quantity than thirty gallons per head per day. Manchester without the aid of any meter has kept the consumption down to about twenty-two gallons per head per day for domestic purposes, and have declined, after due consideration, to use the waste water meter; about twenty per cent. of the houses in Manchester are provided with water closets. In Edinburgh where eighty per cent. of the houses are provided with water-closets they are endeavouring to reduce the domestic consumption to twenty-four gallons per head per day. Oldham used the meter for a time and then gave it up, as the authorities found they could get as good results without it. Norwich, Leicester, and Sheffield have got good results without any meter.

Disparaging remarks have been made with regard to the action o the Waterworks Committee in refusing the offer made by the Palatine Company to fix a meter in a district free of cost, and thus to show the saving which can be effected by its use. This offer was a very plausible one, and in my opinion there was no necessity to accept it. Everyone knows that there is waste not alone in Dublin, but in every city in the world, and what would the fixing of a waste water meter tell us beyond what we already know, and to prevent and keep down which the day and night inspectors are constantly at work. The only thing the meter would do then if fixed would be to give a rough average of the quantity of water passing into the district, before the inspection, and after the district has been finally dealt with. But this the Corporation themselves can do at any time without the aid of any outside company, by simply fixing one of their own meters used for trade purposes, which will guage water much more acurately.

I do not wish to disparage any waste water meter system, but I deny in the strongest manner the statements so recklessly made regarding the results obtainable from these meters, as if they were the only factor required in the prevention of waste in a city.

I am free to admit that a recording meter is of use as a check on the men, it shows that they are keeping up to their work, and approximately the consumption of water in a district. But even this can be more accurately shown by the meter ordinarily in use for trade purposes.

It is a curious fact that when the inspector is withdrawn from a district for two or three months and again returns, it is found in nearly every instance that it has lapsed back again to its former

The cost of introducing a waste water meter system in Dublin would be very expensive; the system in Edinburgh with a population real lation nearly equal having been estimated to £4,000 per annum. Excessive cost was also, I believe, the reason why it was not adopted in Manchester.

I now come to that part of the paper dealing with our future supply, in which the author states that the water of Lough Dan is of a most peaty description, and in mass is perfectly brown, almost black and in mass is perfectly brown, almost black, so that he questions if any amount of filtration will clear it from the 16th December last, and which show that the water is not as black as it is painted.

The author's objection to the water is not borne out by the re-Ports received from some of the most eminent analysts in the city. With regard to the works at present, I do not wish to go into detail as to this portion of the paper; but if the water be taken

from Lough Dan it can be done without the construction of a large embankment, and water conveyed to the Vartry filter-beds possibly

at a less cost than the £100,000 mentioned.

The author is in error in stating that the most of the land in the Vartry valley above the present reservoir is already in possession of the Corporation, the contrary being the fact.

V.—The Financial Crisis in the United States, 1893-4. By T. S. F. Battersby, M.A., Barrister-at-Law.

[Read Tuesday, 26th June, 1894.]

In these days of rapid transit and intercommunication between the most distant nations, the fluctuations of trade and finance in one country react immediately and sympathetically upon all others with whom it has financial or commercial relationship. Trade is, in the broadest sense, international, and it is essential that statesmen, economists, and traders, who desire to forecast the trend of business operations in the future should study the conditions of foreign trade in the present. The world-wide ramifications of British commerce impose on those engaged upon it a correspondingly large and difficult task, and one that demands the highest qualities of mind. conditions affecting our trade with the United States of America render its financial position and trade legislation of especial interest to this country, and some lessons may be learned from a review of the financial crisis of 1893-4, presenting as it does phenomenal aspects, to which, perhaps, sufficient attention has not hitherto been drawn, and affording, in addition, a vast object lesson on some of the burning questions of political economy.

The year 1893 in America stands unique in that it presents an unrivalled record of failures of solvent banks, corporations, firms, and individuals in a country having unsurpassed facilities for production and distribution, and a people who are intellectually and physically equal, if not superior, to those of any other country. At the close of the year 1892 there were no rocks in sight. The relative prosperity of the United States had for two years, since the Baring panic in London, been an object of admiration or envy to the old world. Never were the American people prouder of their progress, never so self-confident, never so laudatory of their country, their government, their laws, their people, and their prosperity. In six short months all this was changed to depression, fear, weakness

in trade, and complete collapse in credit.

In the autumn of 1893 I was in the United States, at the time when the financial depression had reached a crisis. On the day I reached New York the banks there had refused to cash cheques drawn on the banks of Washington, Philadelphia, Richmond, Boston, and elsewhere, and the commercial firms of New York were obliged to send members of their houses to those cities for the purpose of having drafts drawn on the local banks cashed there.