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## The August Cloud-Burst in Des Moines County

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Naturally, the trees on the south and west were, to some measure, supported by those within, while those on the north and east, having no such support, succumbed to the sleet. A like effect may be noted in the case of trees in isolated localities, and in hedges. In hedges running east and west the greatest breakage was observable on the northern side—especially in the case of willow trees—whose leaning habit of growth made them particularly susceptible. In hedges running north and south the damage was not so great nor the effect so well marked, but here, as a rule, the greatest breakage was on the east. However, although these conditions were so general as to be readily observable, there were many apparently inexplicable exceptions, but in the main the effects of the storm were as here given.

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## THE AUGUST CLOUD-BURST IN DES MOINES COUNTY.

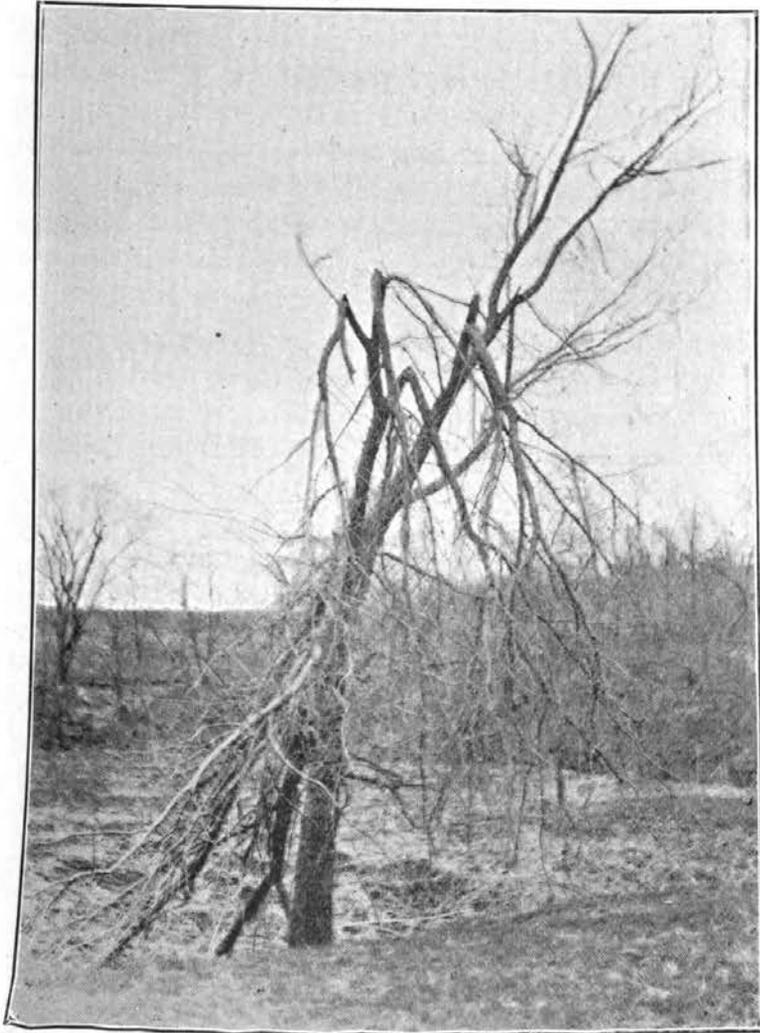
BY MAURICE RICKER.

It is my purpose to give merely a statement of facts concerning the storm which deluged Des Moines county the morning of August 16, 1898. I believe it was the heaviest rainfall ever noted in the United States for the period of its duration, and while the area covered was not large, it proved to be very destructive. No doubt there have been storms in which the precipitation was as heavy, where no one saw fit to chronicle the event. Many great disasters, as the Johnstown flood, with a greater area and less precipitation, have become historic, because of loss of life.

My attention was called to the excessive rainfall that morning at daylight by the little swollen creek which divides South from West Hills in the city of Burlington. Yet this was in the very edge of the storm. The newspapers contained many sensational stories of narrow escape from loss of life, damage to county, city, railroad and farming interests. I read these with no special interest and dismissed their estimates of sixteen to twenty inches of rain in Flint valley as exaggerations so commonly found in popular accounts of natural phenomena. As soon as the tracks were repaired I had occasion to make

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PLATE III.



**Soft Maple near Greenfield Broken by Sleet.**

many trips by rail through the flooded district. The terrible strength of the water flow then became apparent and, noting the limited drainage area of Dry Branch in particular, I began to take more interest in the event, believing at this time that the real precipitation must be about five or six inches. I have since made a thorough canvass of the county and record for those interested in these phenomena only those things which are beyond dispute.

At 10 o'clock on Monday night, August 15th, it began to rain. The precipitation was not extraordinarily heavy, and while it rained steadily no one noticed that there was anything unusual about it. According to good authority, the so-called cloud-burst began about 2 o'clock A. M. and ceased shortly after 4. It rained more or less for an hour later, however. A liberal estimate of time for the heavy rain is three hours. The precipitation outside of these three hours, from all accounts, could hardly have been more than two inches.

The area of heavy rainfall can be approximately bounded on the south by the divide between Spring creek and Flint river. The former stream was not out of its banks. Keokuk reports a trace only. The county line forms a close boundary on the west, Yarmouth being in the edge of the heavy rain, but suffered only from lightning. Washington reports 1.72; Iowa City, .40. The north boundary of very heavy rain is not far above the county line, Wapello reporting 5.16. On the east, the river was the boundary for excessive rain, although the precipitation was heavy as far east as Biggsville, Ill. This maps out two-thirds of Des Moines county, or approximately 250 square miles. The Flint river and its tributaries drain one-half of this area. Dry Branch, Yellow Springs, Dolbee and Swank creeks drain the remainder, save a strip of three miles in width, which drains north into Louisa county. Dry Branch drains only about eleven square miles, yet its waters caused much damage. Yellow Springs creek drains a much larger area and carried, perhaps, more water, proportionately to its bed, than Dry Branch.

It is not easy to estimate the rainfall accurately. There were no rain gauges in the county at this time. I shall give some of the reports as I obtained them. Great care has been taken to get accurate and truthful accounts in this phase of the investigation.

Mr. J. W. Merrill, editor of the *Mediapolis New Era*, vouches for this story: A large circular windmill tank, with nearly straight sides, stood removed from buildings upon level ground. It had never been used as a tank and was dry Monday night. It had a semi-circular cover, which was open, exposing one-half the tank to the rain. The water in the tank measured twelve inches in depth on Tuesday morning. We will grant that some of the water in the tank ran in from the half which was covered. Yet, had it all run in—and it could not—there would have been a rainfall of twelve inches. If the tank had been perfectly level, would more than one-half the water which fell on the cover have entered the tank?

In Dry Branch valley, below Latty, six miles south, lives a member of the county drainage board, a man whose judgment can be relied upon. He states that on Monday night an empty, straight-sided tin can which was used for mixing spray fluids for fruit trees, was left in open ground. The can was about fifteen inches in diameter and sixteen inches high. At 5 o'clock the can was full and running over. North of West Burlington lives a truck gardener, who left standing in the garden several sprinkling pots, whose open tops are half covered with tin in the usual manner. These ought to have shed one-half the water, yet daylight found them all with eight or nine inches of rainwater in them.

Other less reliable cases have come to my notice, where the hole of a barrel becomes the outlet for overflow, etc. The instances given suffice to show the character of the information which leads me to firmly believe that over an area of fifty square miles at least sixteen inches of water fell in three hours.

The instances of incredibly rapid rise in streams, even when already in the flood plains, seem to corroborate the estimates given above, while the records at the Mississippi bridge at 6 P. M., August 16th, show a stage of four feet five inches, a rise of three feet two inches. When we remember that local rain seldom affects the stage of water noticeably, and take into account the limited area of the storm, we must readily see that something extraordinary must have happened. The rain extended some distance up the river, it is true, Clinton reporting 3.01, Davenport 2.20.

The erosion was well in keeping with the figures given for rainfall. Little idea can be conveyed of the force of the water,

which tore up trees twelve inches in diameter and floated rocks weighing hundreds of pounds many feet from their former location. Hay stacks were floated bodily against steel bridges, carrying them many hundred yards down stream. In the city of Burlington whole timber piles floated from the yards and blocked the entrance to the great sewer. Wagons and farm machinery of all kinds went down the Mississippi river, together with many dead animals. The oldest settler had never seen the water so high in these valleys. Many houses, barns, sheds, etc., were flooded, and this in spite of the rapid fall of these streams, which here break through the escarpment to the Mississippi.

The upper valleys broaden out with many fertile flats, often planted in truck and garden produce. The lower stream has low banks through the flood plain of the Mississippi. The rush of water necessarily did very great damage to both crops and soil. In many cases acres of ground which had been fall plowed were denuded of soil and left covered with sand and pebbles.

Flint river, which formerly entered into O'Connell slough after paralleling its course for half a mile, cut a new channel directly through cornfields to the slough, tearing out acres of soil with crops and timber. A raft of logs belonging to the J. D. Harmer Manufacturing company went down before it like straws. O'Connell slough, which had been the storage place for logs in summer and steamboats in winter, was piled with the debris, which will cost \$15,000 to remove unless the ice and high water next spring can scour it out. Manufacturing establishments situated upon the slough will otherwise be cut off from navigation.

Hawkeye creek, a covered sewer through Burlington, became clogged with floating lumber and caused much damage to lumber yards, a foundry, the pickling works and the Murray Iron works. The stone apron at its mouth went out. The clearing of the sewer and the rebuilding of the apron will cause the city's heaviest bill for damage. The county lost twenty-three bridges, some of which have been replaced at an immediate outlay of \$16,000. The Burlington, Cedar Rapids & Northern railway lost nearly two miles of track and five bridges. The bridges which replaced the lost ones are fine steel spans, much better than the old ones, costing \$30,000. The loss to land owners is hard to estimate, but must have

been very heavy in crops and damage to soil. The loss of live stock drowned would probably have been almost as heavy had it occurred in daylight, owing to the very rapid rise of the streams. The estimate of \$100,000 total loss is not far from correct.

There are many other interesting features which should be written up. The weather conditions can be obtained from the weather bureau. The map for the date shows a low reaching into Iowa, but would not warrant a forecast of general rain. The energy liberated by so heavy a fall of rain would form an interesting study. I have collected some data concerning similar storms in previous years. The heaviest fall that has come to my notice was fifteen inches, at Wilmington, Del., on the 29th of July, 1839.

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## THE BURLINGTON ARTESIAN WELL.

BY FRANCIS M. FULTZ.

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Work was commenced on the Burlington artesian well about midsummer of 1896; but, owing to cessation of operations for somewhat more than a year, it was not finished until midsummer of 1898. The well is located in Crapo park, and the expense of putting it down was borne out of the park funds.

It was expected that a flow would be reached in the St. Peter sandstone at a depth of about 900 feet. This belief was based on the flow obtained at the Ft. Madison and Keokuk wells, south of Burlington about twenty and forty miles respectively. As will be seen from the subjoined section the St. Peter was reached at a depth of 950 feet. No flow was obtained, but the water rose to within thirty-eight feet of the surface, and indicated a strong supply. There was no further change of the head of more than a foot or two, although the drilling was carried down to 2,430 feet and passed through at least two other water-bearing strata.

The diameter of the well is six inches for 1,700 feet and five inches for the balance. No casing is used excepting through the loess and drift. At 1,700 feet a test was made of the capacity. Over 100,000 gallons were pumped out daily for one