

temporary works. But if the breaking up is caused by rains, it is accompanied by a sudden rise of several feet, a rapid current, and destructive gorges ; such was the case in 1867, when the ice broke up, on the 7th of February, with a sudden, though temporary, rise, and a current of six or seven miles an hour.

This behavior of the ice is not unlike that on all large rivers, while its movements are much more violent and destructive in colder climates than that of Kansas City ; the only danger to be apprehended comes from the first five or ten miles of ice, as the rapid current and crooked channel soon break the larger fields into cakes too small to do much damage. The phenomena of the shifting channel and variable bottom were, on the other hand, in a large measure peculiar to the Missouri, and the difficulties which they must cause under the most favorable circumstances, were augmented by the imperfect understanding of them which existed ; they had been made subjects of common report rather than of accurate observation ; they were well known to old settlers and to river pilots, but the Government Surveys, to which we are indebted for our best information concerning the Mississippi and its other tributaries, had not been extended to the Missouri. The isolated character of the location, nearly three hundred miles from any general markets or machine shops, and a very much greater distance from the manufacturing centres of the country, was an additional source of trouble, involving the construction of an equipment which could elsewhere be bought or hired in a few hours, and causing occasional inconvenience by delays in the arrivals of material ordered from a great distance.

As Kansas City is situated immediately below the mouth of the Kaw, the Missouri is there affected by all the floods of the upper rivers, the Platte, and the Kaw, but free from those of the Osage and the lesser tributaries below. The distance between the bluffs is here about two miles, but the course of the channel is somewhat complicated by changes in their direction ; the eastern bluff curves from its nearly north and south course to one bearing east and west ; that which is the west bluff of the Missouri, a few miles above, becomes here the north bluff of the Kaw, leaving a considerable bottom land west of the city ; east of the town the southern bluff follows a tolerably regular course. The channel has continued for an indefinite time at the foot of the bluff, in front