tions of certain of the other levers in the frame. To exemplify this, we will take three levers, A, B, and C. If A and B be in such position that a signal given by the movement of lever C will be dangerous or misleading to a train, the pivoted bar connected to lever C is locked, and cannot be moved by any exertion of strength on the part of the signalman; and therefore he cannot even begin to move lever C, and the possibility of giving a wrong signal is put beyond doubt. Similarly, nothing is effected unless the lever completes its stroke. The pivoted bar or 'rocker,' through which the whole work of interlocking is done, moves only at the extreme ends of the stroke of the levers, and then is only moved by the rising or falling of the spring detent. This invention, simple as it seems, is the result of many years' experience, accidents having often occurred through a lazy signalman pulling his lever through part only of the stroke, and thus only partially effecting the locking. This is now impossible; and the *intention* of a switchman to move a lever, expressed by his grasping the lever and so moving the spring-catch, independently of his putting the intention into force, actuates all the necessary locking.

The details of locking-apparatus are somewhat complicated, but the principle is simple. Certain bars carrying lugs or projections are made to slide or move by the movements of the rockers. Certain other bars, which are also moved by the action of one or more rockers, are slotted or pierced with holes, so that, in certain positions, the lugs in the first set of bars can enter the holes in the second set of bars, and, in other positions, the lugs strike against the bars, and cannot be moved. It is, of course, obvious that the arrangement is such as to prevent unsafe or contradictory signals being given, and permit only of safe or harmonious signals; and, by a careful arrangement of the locking-apparatus, it is sometimes possible to make a few movements effect important changes of the switches and signals with a minimum of levers and complication.

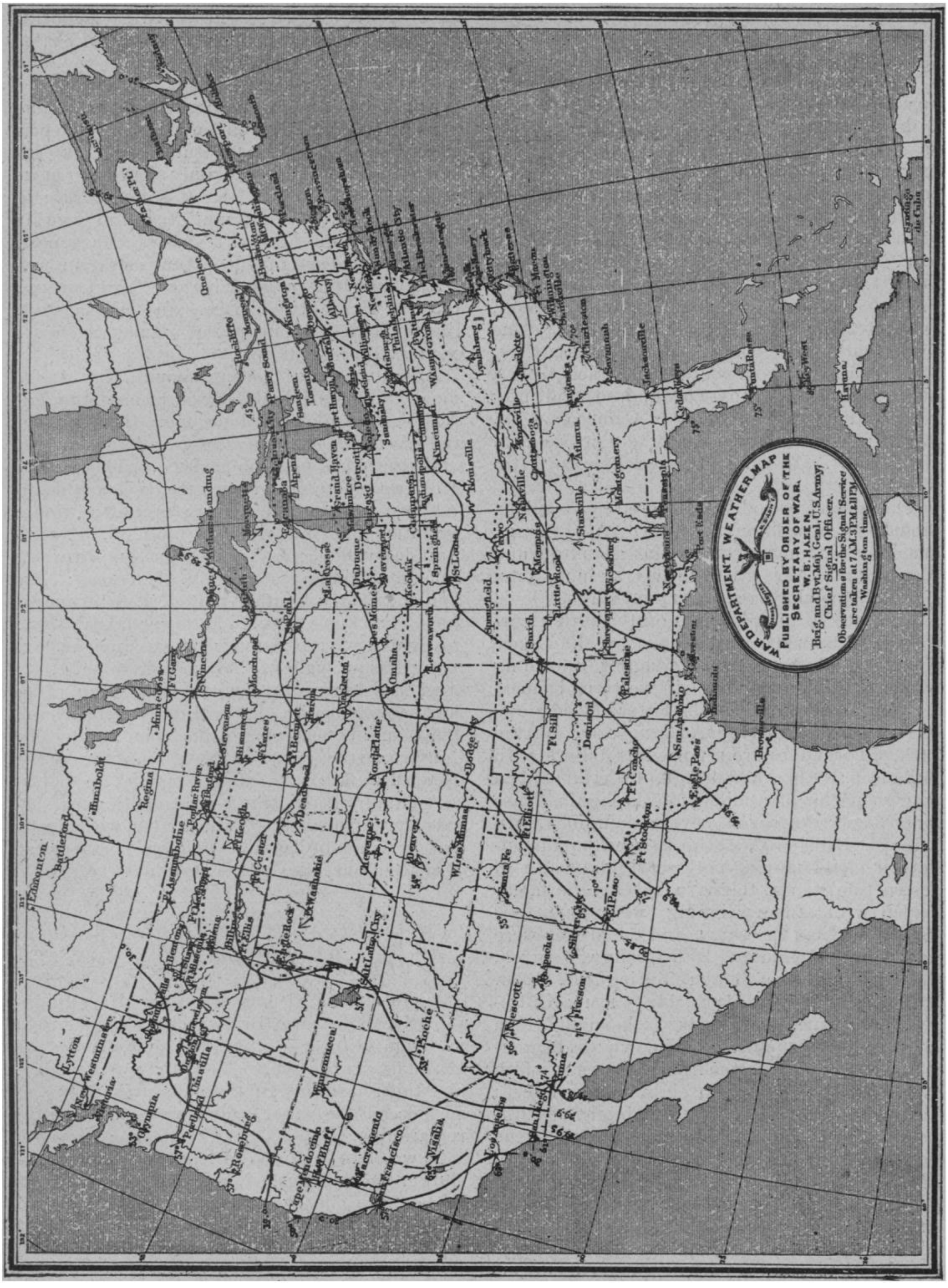
It is obvious, that, when switches are worked from a distance, there is a chance of the switch being incompletely closed, owing either to dirt, or a stone, or ice, choking the switch itself, or the switch-rods working it. There is also a danger that the switch-rod might break or become disconnected, and that, though the signalman moved all his levers, and all the locking and unlocking was properly performed in his cabin, yet the switch itself might remain unshifted, or be left half open. To obviate this, the facing point lock was invented. This is a bolt which can only be shot into a crossbar connecting the two rails of the switch when the switch is either properly closed, or wide open. A failure of the switch connections, or an obstruction in the switch, will render it impossible for the bolt to enter the opening to lock the switch; and, as the signalman's lever actuating this lock interlocks with the signal levers, no train can be signalled to approach until the switch is either closed, or wide open, as the case may be, and firmly locked in its proper position. But another danger has to be guarded against: signalmen, to save time, will generally throw a signal again to danger directly the engine of an approaching train has passed; his other levers are then set free, and he can unlock his switch, and actually change the switch, before the whole train has passed, thus probably throwing the rear vehicles off the track, and causing a serious accident. To guard against this, a locking or detector bar is used, which lies near the rail, but clear of a wheel, when the switch is either shut or full open; but directly the switch is moved from either of these positions, the bar moves close to the tread of the rail, and takes such a position that it must come in contact with any wheel approaching the switch. As the bar is made longer than the distance between any two trucks, it follows, that, as long as a train is passing over the switch, one or more wheels of the train must prevent this bar being moved, and, as the switch-lock and the bar are arranged to move together, it follows that the switch cannot be unlocked until the last truck of the last car of a train has passed. The Union switch and signal company adheres to Saxby and Farmer's arrangement of this bar where it moves vertically. The Pennsylvania steel company shifts it laterally. The latter movement is more easily performed, and the bar can serve as a guard-rail; but its movement seems somewhat liable to be impeded by snow falling between the rail and bar.

(*To be continued.*)

THE WEATHER IN MAY, 1883.

THERE have been two periods of very severe storms, and at many places of tornadoes. The first of these accompanied a 'low,' first noted in Colorado[1] on the 13th. This moved with considerable energy over Colorado and Nebraska. On the 14th, increasing in energy,

[1] It has been found necessary, owing to the smallness of the appropriation, to give up all telegraphing reports west of the Rocky Mountains: hence the charts are made up only to the east.



MONTHLY MEAN ISOBARS, ISOTHERMS, AND WIND-DIRECTIONS, MAY, 1883. REPRINTED IN REDUCED FORM BY PERMISSION OF CHIEF SIGNAL-OFFICER.

it advanced into Ohio. At the morning observation of this date, pressures .5 to .6 inch below the mean were noted in Iowa.

Reports of hail on the 13th, 14th, and 15th, sometimes of astonishing size, have been sent from thirty-six stations, mostly in Iowa, Kansas, Missouri, Indiana, and Illinois. The following is a brief summary of tornado reports. Indiana: Amity, 14th, 7.30 P.M.; Waterloo, night of 14th, only three houses left standing; Muncie, night of 14th; Indianapolis, 14th, 6 P.M. In Kansas: Troy, 13th, 5 P.M.; Muncie, 13th, 4.30 P.M., most violent storm ever known in the county. In Michigan: White Pigeon, 14th, 4 P.M.; Sturgis, 14th, 3.30 P.M., came from south-east. In Missouri: Kansas City, 13th, 4.30 P.M., from south-west, track from a hundred and fifty to two hundred and fifty yards wide, damage $300,000; Cameron, 13th, 5 P.M.; Macon, 13th, 8 P.M.; Pattonsburg, 13th, 5 P.M. In Ohio: Frederickstown, 14th, afternoon.

The second period was ushered in by a deep 'low' in Colorado on the 17th. At 11 P.M., Washington time, pressures at Yankton and North Platte were 29.16 inches, or more than .7 inch below the mean. On the 18th the 'low' moved into Minnesota, and on the 20th a portion of it moved east into the St. Lawrence valley; while its influence was felt in forming a second subsidiary 'low' in western Tennessee on the same date. The latter moved slowly, and passed off the Atlantic coast on the 24th. Tornadoes are reported as follows. In Arkansas: Eureka Springs, 18th; it cut a path a quarter of a mile wide through a dense forest, and destroyed several buildings. In Illinois: Hillsboro', 18th, 10 P.M., a funnel-shaped cloud moving north-east, the width of destruction, ten to thirty rods; Grafton, a car loaded with stone weighing twenty-one tons was lifted from the track, and the stones were scattered; Chemung, 18th, before 6 P.M.; Chicago, night of 18th; Springfield, 18th, 7.10 P.M.; Pesotum, 18th, 11.30 P.M.; Littleberry was nearly destroyed; Jacksonville, 18th evening, severest storm ever known; Edwardsville, 18th evening, came from south-east, width of track six hundred to eight hundred feet; Tallula, 18th, 9 P.M. Up to midnight of 19th, the number of deaths in Illinois caused by the tornadoes of this date was sixty-three. In Missouri: Moody, 18th, 19th, every house blown down; Berger, 18th, 7 P.M., six houses and one mill destroyed; Oronogo, 18th, 7.40 P.M., six persons killed, $75,000 damage. New York: 21st, one of the severest storms that ever visited Long Island. In Tennessee: Chattanooga, 20th, 4 P.M. In Wisconsin: Janesville, 18th evening; Racine, 18th, 7 P.M., twenty-five people killed, damage $60,000, track five hundred yards wide.

The chart of monthly isobars, isotherms, and wind-directions is given on p. 35. The permanent summer low-pressure area has enlarged a little, and moved only slightly from its position last month. Mean pressures are in general below the normal, except in Florida and the upper Missouri valley. The mean temperature east of the 100th meridian was 3.1° below the mean; highest temperature, 109° at Eagle Pass, Tex., and Yuma, Cal. Illinois and Missouri report damaging frosts on the 22d.

A comparison of floating ice with May, 1882, shows the eastern limit 3° west of last May, but the southern limit is the same. The number and size of icebergs are much less than last year, while there has been no field-ice. The Gulf of St. Lawrence, blocked last year, is clear this.

There were deficiencies in rainfall: Middle Atlantic, .58 inch; West Gulf, 1.50; Rio Grande valley, 2.93; extreme north-west, 1.65; and middle plateau, .69. Excesses: New England, 1.41; South Atlantic, 2.91; Tennessee, .54; Ohio valley, .77; lower lakes, 3.02; upper lakes, .85; upper Mississippi valley, .68; Missouri valley, 3.03; middle slope, 1.09; southern slope, 1.91; northern plateau, .99; North Pacific coast, .86; Middle Pacific coast, 2.33; and Southern Pacific coast, .80. In California the rain has been four times the usual May fall.

A hundred and thirty-nine cautionary signals were displayed, of which 84% were justified by winds of 25 miles or more per hour, at or within 100 miles of the station.

SYMMETRICAL LINEAR FIGURES PRODUCED BY REFLECTION ALONG A RIVER-BANK.

In July, 1882, I noticed on the Magaguidavic River, in New Brunswick, some figures, apparently formed through combination of actual fissures in the rocks at the water's edge, and the reflections of these fissures from the surface of the water, which were not a little remarkable.

It was late in the afternoon. One thunder-shower had just ceased, and another was about to begin. The sky was somewhat overcast, and the water more or less shaded by the forest which covers most of the adjacent land. The banks of the river are bold, the shore being lined in many places with steep rocks having abrupt