

about the bays and sounds of North and South Carolina, and indeed on a great part of the coast, only a granite block with crosshairs cut in the top marks the various points in the triangulation, and as these, especially on sandy coasts, are taken out and utilized by the fishermen as anchors, the "points" have to be re-determined or other ones made before the work of hydrography can even be started.

A few weeks of clear weather will generally suffice to redevelop the triangulation, but if such a scheme had never been carried out, the preliminary labor to be performed would be immense; a whole season and perhaps two would intervene before the hydrographers could begin operations. An observatory would have to be erected, protracted astronomical observations taken, and a base line measured—a tedious and delicate work.

Hence it is that the statements in the recent Washington dispatches to the effect that "the survey of the coast is likely to last for a thousand years," though intended evidently for irony, do not necessarily prove a lack of expedition in the work, nor a reason for its discontinuance.

THE REIS TELEPHONES.

It is a well received principle in patent law that an invention is protected for all possible uses, even for such as were unforeseen by the inventor. In some of the voluminous testimony and arguments of the Bell telephone suits, it has been suggested that the transmission of articulate speech was not contemplated in the original Bell telephone patent. Yet under the law such a feature would not invalidate the patent, which would be good for all its uses.

The same state of things exists in the case of the old Reis telephone. Philipp Reis invented, constructed, and experimented with a number of different kinds of telephones during a period extending from 1859 to 1874. He died in 1874. Precisely in accordance with modern telephone practice, he divided his instruments into two classes, transmitters and receivers. These instruments have been repeatedly tried of late years, and it has been definitely determined that they will transmit articulate speech. It would seem therefore that in them would be found the complete anticipation of Bell's broad claim to the electrical transmission of speech. But the point is made that in Reis' hands his instruments did not effect this. It is argued that they were only designed to transmit sounds in general, such as the tune of an air sung into the receiver, or the notes of a piano or other musical instrument. The analogy between the position of the 1876 Bell patent and the Reis telephones is perfect. In both instruments is latent the capacity for transmitting speech, but by neither Bell nor Reis was this power distinctly claimed.

In view of the really striking analogy, the anticipation seems most complete. Both inventors appear on the field with devices adapted for the same end, but neither with perfect distinctness claims this function as a part of the invention.

The courts in their sweeping decisions in favor of the Bell patent dispose very summarily of Reis' inventions. In one decision the judge rather gratuitously says that a century of Reis would not have produced an operative telephone. By all the decisions Bell's claims have become so broadly construed that the actual Reis telephone could not be used without infringing them, if it were so used as to transmit speech. In other words, if one of our readers were to place a Reis transmitter in one house and a Reis receiver in another, and connect them by wire, and were to talk over such a line, he would constitute himself an infringer of Bell's claims, though he was using an invention made by a man who died two years before the date of Bell's 1876 patent. If Reis himself, as is almost certain, spoke through his telephones, he ought to be considered an infringer in advance of his time. Seriously speaking however, the bearing of the Reis inventions upon the Bell claims depends on the following facts: Reis' telephones did transmit sound; they probably transmitted speech in the days of the inventor, as they are perfectly capable of doing so at the present time. This much should constitute them an anticipation of the broad claim to electrical transmission of speech. But their effectiveness as anticipations would be vastly increased if it could be definitely proved that speech had been transmitted by them during Reis' lifetime.

Numerous passages from Reis' writings are cited to prove this. But they all are considered unsatisfactory to about such an extent as is the Bell patent of 1876, in its own claims to speech transmission. An appeal to Reis' contemporaries has been made with far more fruitful results. In Professor S. P. Thompson's work on the Reis telephone, a number of letters from friends of Reis are printed. Many of the writers are men in high standing in the scientific world. The letters are in some cases to the effect that articulate speech was received through the telephones as early as 1859-1864. Others are not so definite as to the facts. But the general unanimity of all on this subject is most striking. They effectually disprove of the "century of

Reis" theory, so firmly upheld by one of the circuit judges.

The fact is that the scope of the Bell patents as determined by the courts is a monument to the ability of the lawyers engaged by the Bell Telephone Company. So thin a series of claims were in all probability never before made to protect a monopoly so securely. We are firm believers in according protection to inventors. The recent tendency of the courts to destroy patents should certainly be deprecated by all who have the real interest of the country at heart. But, in equal measure, the unjust broadening of claims should be condemned by all. A monopoly of an extent measured by one hundred millions of dollars should not be sustained on any but a solid basis. The inventor, Mr. Bell, has reaped ample reward for any merit that did exist in his labors. As his work seems to have been so largely anticipated, and as the public are really suffering from the rigid monopoly awarded his stock company, it is time his claims were more carefully scrutinized and their extent limited. This work we hope will be effectually done by the Supreme Court, whenever the case will be properly presented to them.

The general opinion of patent lawyers is that the United States Supreme Court has been too rigid in its dealings with original patents and reissues. Few patents comparatively can stand before it. The Bell patents have not yet reached this last tribunal. When they do, some restriction will certainly be placed upon them. It will not be strange if the much criticised action of the court in patent cases shall at last be productive of good, and tend to defining and restricting the extent of a monopoly that has become a public evil. The morals of the case and justice to the inventor have been amply satisfied. It now is only a question of how to deal with the members of a giant corporation. On the one hand is the comparatively limited number of stockholders, on the other hand is the public at large. The inventor and his family have all reaped fortunes out of the patent. The corporation itself has founded a business that the entire annihilation of the patents would not destroy. Thus even in the destruction of the Bell patents no hardship would be done, and the public would be vastly benefited.

Fire Losses.

The *Chronicle* fire tables for 1885 contain a review of the total losses from fire in the United States and Canada during the past ten years, which shows an appalling destruction of values from causes largely preventable. During this single decade, the loss of property by fire amounted in the aggregate to nearly \$900,000,000, a sum so large as to be quite past belief, did it not rest upon undeniable statistics.

The distribution of this immense loss has been rather curious. Upon the assumption that the average loss per capita amounts to about two dollars a year, we find that two-fifths of the annual combustion occurs between elevations of 500 and 1,000 feet above the sea; three-fifths, where the mean annual temperature ranges from 45° to 55°; two-fifths where the mean annual temperature of July is from 70° to 75°; nine-tenths where the range of maximum temperature is from 95° to 105°; seven-tenths where the annual rainfall ranges from 35 to 50 inches, and three-tenths where the rainfall of spring and summer is from 20 to 25 inches. Between the 40th and 41st parallels of latitude and the 73d and 84th degrees of longitude a greater loss occurs than between any others.

Since 1880, the fire losses have been increasing rapidly, the greatest difference coming between the years 1882 and 1883, when the increase amounted to \$16,000,000. The monthly proportion shows also a number of curious features. While the losses during other months are quite variable, they seem to be very regular in February and March. The widest ranges have been noticed in January and in the early fall.

The causes of fires have also been carefully classified, and the results show an alarming predominance of incendiarism and of defective construction scarcely less criminal. For several years past, approximately one-third of all fires were the work of incendiaries, and the percentage in the different States and Territories varied in 1884 from 11 per cent in California to 62 per cent in Kentucky.

These variations seem to have no dependence upon density of population, but show an undoubted connection between incendiarism and illiteracy, although the States named represent by no means the apex or base of the social pyramid. The monthly curve of incendiarism for the years 1883 and 1884 shows two periods of maximum outburst, the smaller occurring respectively in May and April, and the larger in September and October.

Under other divisions, equally curious results have been obtained. Take, for instance, the influence of atmospheric conditions. As one would expect, the greater loss occurs during the dry season of the year, when everything is more easily inflammable, and the means for extinguishing fire are less available. But the difference is less than would be supposed. In the number of fires the excess in the dry season is only 4

per cent, while the greater loss is 17 per cent, showing that the real discrepancy is due to the greater destruction wrought by fires rather than to the actual increase in their number. The statistics show further that, other things being equal, the fire loss of a locality, for any considerable period, varies inversely with the rainfall.

At the present time, in the United States and Canada, we are suffering a monthly loss from fires of almost \$10,000,000—a tremendous tax upon our wealth producing power. While the scheme of insurance has mitigated the burden somewhat by distributing it over many shoulders, it has given rise to a deplorable falseness in the popular reasoning. People have come to believe that a policy cancels loss, and it must be confessed have come likewise to act upon the principle. Omitting the flagrant immorality of incendiarism, there is still a large class of apparently respectable citizens who permit themselves to regard the preservation of property for which others are responsible as less sacred than if the weight of loss rested upon themselves.

We can only look for the decrease of fires in any community where there is a proper building inspection, and still more where there is a healthy state of moral sensitiveness.

Industrial Comparison between Illinois and Massachusetts.

The most interesting portion of the report of the Illinois Bureau of Labor Statistics is that devoted to a comparison of the industrial conditions of Illinois and Massachusetts. As similar methods of inquiry were followed in the two States, there is the more value in the results obtained. The following conclusions are made: Twenty-one industries, represented by 2,440 establishments, were taken in Massachusetts, and 34 industries, represented by 1,666 establishments, in Illinois. The 2,440 establishments of the former State employed 207,793 hands; the 1,666 establishments of the latter employed 95,912 hands. The whole number of manufacturing establishments in each State is about the same, Illinois having 14,549, and Massachusetts 14,352. Illinois has 1,848 establishments in which \$5,000 or more was paid in wages during the census year, and 1,666 of these were used in the investigation. Massachusetts has 3,663 establishments in which \$5,000 or more was paid in annual wages, and 2,440 were used in the investigation. Thus there appears to be in Massachusetts nearly twice as many large establishments as in Illinois, and not only a greater number, but the establishments themselves are more extensive, as is shown by the fact that the average number of employes to each in Illinois is only 57+, while the average for each establishment in Massachusetts is 85+.

In Massachusetts, 30.13 per cent of all employes are women, while in Illinois only 12.16 per cent are women, and the preponderance of this class, and the laws governing their employment in Massachusetts, prepare us for finding 80+ per cent of the establishments in Massachusetts running 10 hours, as against 63+ per cent of those in Illinois. This disparity is modified somewhat by the fact that 26+ per cent of those in Illinois run less than 10 hours, as against 16+ per cent of those in Massachusetts; but, on the other hand, the number of those which run more than 10 hours is much greater in Illinois than in Massachusetts.

In Illinois children and youth constitute only 6.07 per cent of all employes; by far the largest percentage, 37.75, being found in the tobacco factories. In Massachusetts, 4.93 per cent of the workers are children.

The daily earnings are \$1.51 in Illinois and \$1.23 in Massachusetts, and the yearly earnings in the former are \$430, and in the latter \$358. Both amounts seem very low, but it must be remembered that they are not the yearly earnings of men, but an average of all the earnings of men, women, and children. As Massachusetts employs nearly twice as many women and children in her industries as Illinois, this large proportion of cheap labor would doubtless account in a great measure for the discrepancy in these averages of earnings in the two States.—*Bradstreet's*.

A Waterspout.

A dispatch from San Antonio, Texas, July 6, says: "Yesterday morning, near Walden, 150 miles west of here, an eastbound freight train was struck by a waterspout. The engineer saw the spout approaching, bounding along like a rubber ball, tearing up the earth and uprooting all in its way. He reversed the train to avoid the waterspout, whose course was tortuous. Just as the waterspout reached the line of the road it changed its course, and pounded along parallel with the road with frightful velocity. When opposite the train it burst, deluging the engineer, fireman, and brakeman, who abandoned the train and climbed some trees to avoid a wave of water fully eight feet high and about 100 feet wide. The locomotive and 14 cars were raised bodily and carried nearly 200 feet from the track, while the roadbed was completely obliterated. No one was hurt. The extent of the damage is unknown. Through trains west of here on the Sunset road have been abandoned. Roadbeds and a number of bridges have been washed away by recent heavy rains."