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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

SLAG A CAUSE OF BROKEN RAILS.

The scientific investigation of the cause of broken rails has a strong claim on popular interest, and this for the reasons that we all are more or less frequent travelers by rail, and that the breakage of rails is one of the most fruitful causes of serious railroad accidents. The agitation of three years ago, which followed upon the publication by the State authorities of statistics showing an alarming increase in the number of broken rails, has been productive of excellent results. It has served to bring together the rail manufacturer and the railroad engineer in a joint endeavor to determine more exactly the causes of rail failure, and devise improvements in the methods of manufacture which will give a thoroughly reliable rail without entailing an undue amount of extra cost in the making.

During these intervening three years, a most exhaustive chemical and mechanical investigation of the subject has been made, and many hitherto obscure and little-understood facts have been brought to light regarding the mechanical condition and chemical composition of faulty rails; the causes which have produced these conditions; and the best methods of casting and working to produce a rail which will stand up under its work, without betraying that alarming liability to sudden fracture, which has caused so much loss of life and property during the past few years.

One of the latest papers on the subject was that presented by Messrs. Fay and Wint at the annual meeting of the American Society for Testing Materials, in which attention was drawn to the frequency with which rail breakages may be traced to the presence of slag. The investigation by these gentlemen of rails that had broken in the head shows the presence of excessive slag; a segregation of slag concentric with the rail section; remnants of slag in the large split portion of the head; and slag in those areas where flow of metal has occurred or where microscopic cracks have developed. While it is impossible from the evidence so obtained to state definitely the exact cause of fracture, it is highly probable that it is due to imperfectly welded blowholes or pipes. The investigation showed that at the point of fracture there is always to be found a large amount of slag; that cracks invariably begin in and follow from one slag area to another; and that cracks within the body of the metal produced by shrinkage strains will follow along the slag areas. Thomas Andrews, in his paper entitled "Microscopic Internal Flaws Inducing Fracture in Steel," considers it to be a most significant fact that in the various material he examined, almost without exception, there was a considerable slag area, in or near the fractured surface; and he says that the internal microscopic flaws which are almost invariably present in steel forgings constitute a chief source of initial weakness in axles, rails, shafts, heavy guns, etc.

The hard spots which have been observed in broken rails are apparently du either to imperfect mixing and solution of the ferro-manganese, or to the hardening of the surface of the metal due to slipping of the driving wheels, or to segregation in steel alloys. The first and second causes are not common, but the third, which is due to the imperfect melting of the alloy, is more serious. An examination of several nickel-steel rails which had broken in service showed streaks of very hard, medium hard, and soft metal, and it is the belief of the authors of the paper that this lack of uniformity is due to segregation of the nickel during the cooling of the ingot. It is suggested that the various defects above mentioned could be remedied, first, by using a specification asking for lower sulphur; secondly, by allowing more time between the addition of ferro-manganese to the hot metal in the ladle and the pouring of the metal into the ingot mold; and thirdly, by pouring the metal from the bottom of the ladle. Finally, although Messrs. Fay and Wint believe that electric refining will remove many of the difficulties attendant upon the present method, it must not be assumed that this would prove to be a panacea; since without competent control bad steel can be produced just as easily in an electric furnace as by any other method.

OUR VANISHING TIMBER SUPPLY.

When the adventurous navigators of three or four centuries ago skirted the coasts and entered the bays and rivers of this country, they were impressed with the extent and variety of the forests which everywhere spread their rich mantle over the country. And well they might be; for the original forests of the United States exceeded in the quantity and variety of their timber the forests of any other region of similar size on the globe. Nature was lavish when she laid out and planted the five great forests of this country; and lavish she was when she planned its noble water-courses, smoothed out the vast arable lands of its prairies and wide-spreading valleys, and stored below the surface its priceless wealth of iron ore, coal, oil, and precious minerals. Where Nature had been so prodigal of her supplies, it was perhaps inevitable that man should become equally prodigal in their use; and no doubt the extravagance and wastefulness which have become a national characteristic, are due largely to natural environment.

Of all the natural resources of the country, our forests have been one of the worst, if not the worst, sufferers from extravagance; and this is proved by the simple fact that we use (or waste) ten times as much timber per capita as they do in France, and are, consequently, cutting our forests three times as fast as they are growing. The original forests of the United States included five great forest types. The Northern forest reached from Maine through New England, New York, and Pennsylvania, to Georgia, and through central and northern Michigan and Wisconsin to Minnesota, and covered about 150,000,000 acres, mainly of cone-bearing trees. The Southern forest commenced in New Jersey, and reached from the coast far inland through Virginia, the Carolinas, Georgia, Florida, Alabama, Mississippi, and Louisiana, and portions of Texas, Oklahoma, and Arkansas. This is the great belt of the yellow pine. Its total ori inal area was about 220,000,000 acres. The Central forest, which extended between the northern and southern forests from the Atlantic coast to the western prairies, is the great source of our supply of hard woods. Originally it included not less than 280,000,000 acres. Then to the westward was the Rocky Mountain forest, extending from Montana and Idaho to New Mexico. Here on the high plateaus and mountain slopes is a growth of coniferous tr es, including western yellow pine, Douglas fir, larch, spruce, and cedar. Its original extent was at least 110,000,000 acres. Lastly, and the grandest of all, was the Pacific coast forest, extending through Washington, Oregon, and California, whose original area of at least 90,000,000 acres was covered with the most majestic growth of coniferous trees in the world.

Much has been said and written of late about the destruction of our for sts, and one of the latest and most illuminating pamphlets on the subject is that by R. S. Kellogg, Assistant Forester in the Forest Service of the Department of Agriculture, who tells us that, whereas, at a conservative estimate, these five great forests of the United States covered originally 850,000,000 acres and contained 5,200 billion feet of timber, at the present time their total area has been reduced to 550,000,000 acres, containing less than one-half as much standing timber than they did in their virgin state.

The total yearly drain upon our forests, not counting losses from fire, storms, and insects, is estimated to be about 20,000,000,000 cubic feet. Of our present forest area of 550,000,000 acres, 200,000,000 acres are roughly estimated to consist of mature forests, in which the annual growth is balanced by death and decay, and 250,000,000 acres consist of timber partially cut or burned over, on which with reasonable care there is sufficient young growth to produce ultimately a merchantable, but not a full crop of timber. The remaining 100,000,000 acres consists of forests so completely cut out and burned, that there is not sufficient young growth to pro uce another crop of much value. According to this estimate, the annual growth of all our forests is not over twelve cubic feet per acre, or a total of less than seven billion cubic feet. Since we cut yearly some twenty billion cubic feet over and above what is lost by fire and other natural causes, it follows that we are cutting out our forests three times as fast as they are grown. Just how unreasonably extravagant this country has been in using up its timber supply, is shown by comparison with the conduct of Germany and France. In Germany 37 cubic feet of timber per capita are taken annually from her forests; France is able to get along with but 25 cubic feet; while in this country the consumption is 250 cubic feet per capita. Germany, furthermore, has applied her scientific methods with such good effect, that her state forests are producing to-day an annual average of 48 cubic feet of wood per acre.

It is considered that the demand for more farm land may eventually lead to a further encroachment to the extent of 100,000,000 acres upon our present forests, reducing the total to 450,000,000 acres. The Forest Service considers, however, that it would be entirely possible, if the forest land is improved and the timber economically cut and completely utilized, to produce on the remaining 450,000,000 acres sufficient wood for a population much greater than we now have in the United States.

DEATH OF PROF. LOMBROSO.

Cesare Lombroso, certainly the most widely known if not the most authoritative criminologist of our day, died on October 19th, 1909, at Turin, Italy, at the age of sixty-four. If Lombroso had never written anything else than his "Criminal Man," his name would be handed down in the annals of psychology. Even though in his later years he was given, without careful investigation, to rather hastily fitting into his theory any newspaper story or fact that might have met his eye, it must be stated that his contributions to criminal anthropology are valuable and lasting. His theory that criminals must be regarded as mentally diseased persons, although not yet legally accepted by society as a whole, nevertheless finds favor with a large number of psychologists. No doubt his system of criminology is not so far developed that we are justified in abolishing prisons and treating criminals in insane asylums as Lombroso advocated, but at least it tends toward a scientific solution of the problems presented by crime and its punishment.

It was while he held the post of army surgeon that Lombroso's attention was first drawn to malformations of the skull. An executed murderer's cranium was so markedly malformed, that he was induced to make an investigation to ascertain whether or not the man's crime might not have been occasioned by his cranial defects. The rest of Lombroso's life was spent in piling facts upon that original fact. As a lecturer on psychology at the University of Pavia he later had abundant opportunity for studying inmates of the insane asylum there, and was impressed with the connection between nutrition and sanity. As a result of that study, he showed that a poor quality of maize was responsible for much of the pelagra from which Italian peasants were suffering. After a hard campai n he succeeded in inducing the authorities to take measures to reduce the disease. Lombroso's researches were extended also to the study of epilepsy and genius. His theory that genius was a form of insanity was widely heralded, and attracted not a little comment both hostile and favorable.

Recently Lombroso devoted much time to the study of spiritistic phenomena. He made an elaborate study of Eusapia Paladino, and was won over by her to a partial belief in the physical manifestation of spiritualism, yet he was never quite willing to accept spiritualism in the sense of preservation of personal identity after death.

COUNT DE LAMBERT'S FLIGHT OVER THE EIFFEL TOWER.

The most sensational flight ever made in an aeroplane was that accomplished by Count de Lambert with his Wright biplane on October 18th, when he flew from the aero rome at Juvisy, where an aviation meeting was in progress, to Paris and back, covering a distance of about 30 miles in 49 minutes and 39 seconds. After making two circuits of the aerodrome, Count de Lambert headed for Paris, and, continually rising, soon disappeared from view. He flew over Paris at a great elevation, and by the time the Eiffel Tower was reached, he had risen sufficiently to clear it nicely. He passed directly over the tower, which is 984 feet in height, turned his machine around, and headed back for Juvisy. He arrived and landed safely, and was greeted by Orville Wright, who had just arrived from Berlin after making a special flight for Emperor William—the first aeroplane flight the German Emperor had ever witnessed—a few days before. While in Germany, Orville Wright also made a record height flight, in which he reached an elevation of about 1,600 feet, as near as he could estimate. Count de Lambert's height was visibly demonstrated by his passing over the Eiffel Tower. At a height of 1,000 feet the principal sensation he experienced was that his aeroplane appeared to be scarcely moving. The time, he said, seemed interminable ere he finally reached his starting point. His average speed was about 37 miles an hour.