the work on the great water power tunnel, 7,250 feet long, at Niagara Falls, showing also the extensive scale on which the supply canals were laid out, and the general arrangements for utilizing a water power of about 125,000 horse. The first mill to make use of the power rendered available by the tunnel was that of the Niagara Falls Paper Company, for some months past using 3,000 horse power, to be increased to 6,000 horse power. A concrete subway is also ready for the wires of the Pittsburg Reduction Company, whose plant is about 2,500 feet from the power house, from which the company will be supplied with about 3,000 horse power for use in the reduction of aluminum. The arrangements for the electrical transmission of power to the city of Buffalo are also nearly completed. This power is to be transmitted by means of wires carried upon poles from a 50,000 horse power electric station which the Niagara Falls Power Company have near completion on the main canal. The right of way has been acquired, and all the contracts made for two lines, one of which crosses Grand Island while the other follows down the shore. Two lines are provided that one may be held in reserve, the line through the island being 13⅛ miles long while that following the shore has a length of 18¼ miles. The Cataract Construction Company also own a controlling interest in a company which is developing the water power of Niagara on the Canadian side of the river, and wires from the Canadian station join those of the main line on Grand Island. The transmitting line reaches Buffalo just inside the city limits, where the power will be taken by a Buffalo company formed for its distribution in the city.

In the electric power station three turbines of 5,000 horse power each are in position, and the dynamos are ready to be placed. They are of the Westinghouse alternating system, each with its revolving field directly connected to the vertical shaft of a 5,000 horse power twin turbine built from prize designs, furnished, after a severe competition, by Messrs. Fuesch & Piccard, of Geneva, Switzerland. The wheels are of the Fourneyron or Boyden type, and work 250 revolutions per minute under about 140 feet head. They are of cast bronze of the quality used for propellers of steamships. The water is delivered through a seven foot penstock into the center of the turbine, being discharged upon the 32 blades of the wheel through directing passages formed by 36 deflecting plates. It is expected that the governing mechanism will control the speed under ordinary changes of load with a variation so slight as to be hardly perceptible, gates controlled by the governor opening more or less of the discharge opening, and the efficiency of the wheel being proportionally maintained with only a third of the full gate opening. The weight of the vertical shaft in the wheel pit is sustained by closing the bottom of the casing and causing the water to push upward upon the underside of the disk carrying the blades of the upper turbine. The shaft is of rolled steel tubing about a foot in diameter, with smaller solid portions in the journals, and no fly wheel is required, the heavy fields of the dynamo carried on the shaft affording sufficient momentum and inertia.

The dynamos are constructed upon the two-phase alternating current system, with stationary armature and revolving fields, and are designed to generate a potential of 2,000 to 2,400 volts, which will be increased or diminished by step-up or step-down transformers for transmission or local use. Motor generators will be run for the production of continuous current when required, so that the station will be able to furnish continuous or alternating current of any potential. Two-phase Tesla motors will be used. The station is designed eventually to comprise ten units of 5,000 horse power each, and the wheel pit and building will be extended toward the river and new wheels put in as required. Meantime power from the station itself will be available for carrying on the work, extending the wheel pit and the main tunnel, and the many mechanical operations connected with grading and inaugurating the industrial city which will grow up about this source of cheap and continuous power.

Ruskin on the Locomotive.

In a recently published volume of lectures by Ruskin he says:

"I cannot express the amazed awe, the crushed humility, with which I sometimes watch a locomotive takes its breath at a railroad station, and think what work there is in its bars and wheels, and what manner of men they must be who dig brown ironstone out of the ground and forge it into that! What assemblage of accurate and mighty faculties in them; more than fleshly power over melting crag and coiling fire, fettered and finessed at last into the precision of watchmaking; Titanian hammer strokes, beating out of lava these glittering cylinders, and timely respondent valves, and fine-ribbed rods, which touch each other as a serpent writhes in noiseless gliding, and omnipotence of grasp; infinitely complex anatomy of active steel, compared with which the skeleton of a living creature would seem, to a careless observer, clumsy and vile—a mere morbid secretion and phosphatous prop of flesh. What would the men who thought out this, who beat it out, who touched it into its polished calm of power, who set it to its appointed task and triumphantly saw it fulfill this task to the utmost of their will, feel or think about this weak hand of mine, timidly leading a little stream of water color which I cannot manage, into an imperfect shadow of something else—mere failure in every motion, and endless disappointment? What, I repeat, would these iron-dominant genii think of me, and what ought I to think of them?'

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court—District of Massachusetts.

EDISON ELECTRIC LIGHT COMPANY ET AL. V. BOSTON INCANDESCENT LAMP COMPANY ET AL.

This was a suit by the Edison Electric Light Company and others against the Boston Incandescent Lamp Company and others. Complainants moved for a preliminary injunction.

Colt, J.

The second claim of the Edison incandescent lamp patent (No. 223,898) is for "the combination of carbon filaments with a receiver made entirely of glass and conductors passing through the glass, and from which receiver the air is exhausted, for the purposes set forth."

The defendants' lamp, constructed after the Pollard patent of November 1, 1892, contains all the elements enumerated in this claim, namely: a carbon filament, all-glass receiver, from which the air is exhausted, and conductors passing through the glass. The only difference between the two lamps is that the defendants use a film of powdered silver for the conductors passing through the glass in place of platinum wire, which Edison points out in the specification of his patent as the material to be employed and which is always found in the Edison lamp of commerce. In other respects the lamps are identical. While Edison uses platinum wire, he does not limit himself to this form of conductor in his claim. The language of the claim is "conductors passing through the glass," and therefore, on its face, the claim covers all kinds of material capable of carrying the electric current. If the claim had been limited to conductors of platinum wire, as the filament is limited to carbon, the case might be different.

The invention of Edison resides in the carbon filament. The other elements of the combination were old and subordinate and represent, so to speak, only the environment of the filament. For this reason I do not think the court should seek to restrict the plain meaning of the language of the claim. And there is another reason for giving the claim a broad construction. Edison made an important invention. He produced the first practical incandescent electric lamp. The patent is a pioneer in the sense of the patent law. It may be said that his invention created the art of incandescent electric lighting. Where a valuable invention has been made, the court will uphold that which was really invented and which comes within any fair interpretation of the patentee's claim. (Merrill v. Yeomans, 11 O. G., 270; 94 U. S., 568, 573.)

The argument of the defendants is that this claim of the Edison patent must be limited to the use of platinum wire as a conductor, or its known equivalent, and that powdered silver was not a known equivalent at the date of the Edison patent. Looking generally at the state of the electrical art at the date of the Edison patent and comparing platinum wire and powdered silver simply as elements, apart from any specific combination or invention, it cannot be said that one was not a known equivalent of the other, because powdered metals, including silver, have been recognized since 1860 as conductors of electricity. In asserting that powdered silver was not a known equivalent of platinum wire, the defendants must mean that it was not a known substitute in the combination or invention of the Edison patent or in the art of incandescent electric lighting, and I think the evidence proves this to be true; but, in dealing with an invention which is broadly new, I am not prepared to accept the proposition that, in order to constitute infringement, an equivalent in a patented combination must have always been known at the date of the patent or must have been such as would occur to a skilled mechanic exercising only ordinary mechanical skill.

While the language of the Supreme Court in Rees v. Gould (15 Wall. 187) and other cases seems to support the defendants' contention on this question, the later decisions by that court are not reconcilable with the broad proposition that in all cases the substitution of an equivalent will avoid an infringement, provided it was not known at the date of the patent, using the word "known" in its ordinary sense. (Morley Sewing Mach. Co. v. Lancaster, 47 O. G., 267; 129 U. S., 263; 9 Sup. Ct., 299; Clough v. Barker, 22 O. G., 2157; 106 U. S., 166; 1 Sup. Ct., 188; Union Paper Bag Machine Co. v. Murphy, 13 O. G., 366; 97 U. S., 120.) In the Morley case, Mr. Justice Blatchford, speaking for the Court, says:

"A difference in the particular devices used to accomplish a particular result in such a machine would always enable a defendant to escape the charge of infringement, provided such devices were new with the defendant in such a machine, because, as no machine for accomplishing the result existed before that of the plaintiff, the particular device alleged to avoid infringement could not have existed or been known in such a machine prior to the plaintiff's invention."

In that case the patent was for a machine for automatically sewing shank buttons to a fabric, and it was the first machine to accomplish this result. In the defendant's machine the feeding and sewing mechanisms were new and had been patented, yet the Court held that it infringed the Morley patent. The feeding and sewing devices of the Lancaster machine in the art of automatically sewing shank buttons to a fabric were as unknown at the date of the Morley patent as a conductor made of powdered silver at the date of the Edison patent in the art of incandescent electric lighting.

In dealing with a pioneer invention which creates a new art it hardly seems logical or reasonable to say that, because in the progress of such art some new substance or device has been discovered which can act as a substitute for one of the elements of the patented invention, any one can appropriate the invention by the employment of such substitute; and, further, if equivalency signifies equivalency in the particular combination or invention, it is difficult to point out in this class of cases what known equivalents existed at the date of the patent, for the reason that the combination of elements in which the invention is embodied was first made known by the patentee. The doctrine of equivalents as applied to primary inventions rests upon a more satisfactory basis by the elimination of the qualification of age or time and by holding those things to be equivalents which perform the same function in substantially the same way. The fundamental question is whether the alleged infringer makes use of the essence of the patented invention, not whether he has adopted a known equivalent or made a patentable improvement on the invention.

The motion for preliminary injunction is granted.

Tuberculosis and Butter.

It is hard to get away from the malign influence of the cow. Such at least is the case if we may trust the investigations of bacteriologists and sanitarians. The statistics of slaughtered animals in Prussia, Hanover, Switzerland, and other European countries show that from 2 to 12 per cent of the cattle are tuberculous, and though their flesh is not often dangerous, yet the milk must in most cases have been so. We can guard against tuberculous milk by sterilization, but now danger is threatened us from the butter. Several years ago Heim showed that butter from tuberculous milk contained bacilli and could produce infection. Bang (Deut. Zeitsch. f. Thiermed., vii., p. 5) reached similar conclusions.

Professor Roth, of Zurich, has, however, recently made experiments of more striking significance (Correspond. bl. f. Schweit. Aertz.) He went into the markets and purchased butter from twenty different sources representing different cantons of Switzerland. He then inoculated guinea pigs with this butter. In eighteen series of experiments the results were negative, but in two the inoculations were followed by tuberculosis. In other words, ten per cent of the butter of the Swiss markets contained tubercle bacilli.

Quite independently of Roth, Dr. Brusaferro, of Turin, made experiments with the butter of the Italian markets. In nine tubs he produced infection once, which gives about the same proportion as Roth's.

It is not to be supposed that 10 per cent of market butter is necessarily dangerous, for in many instances the number of bacilli is small and quite unable to cope with the juices of the stomach. Still, infected butter is not safe to the predisposed, and the fact of its existence in Europe at least should be borne in mind. What makes the matter additionally serious is the fact that there is not, so far as we know, any practical way of sterilizing butter.—Medical Record.

Mounting Photographs.

The satisfactory mounting of photographs is a troublesome operation, and the following suggestion from a contributor to the Outlook may be of assistance to amateurs: I have found a method by which a photograph or engraving can be mounted on the thinnest paper without curling or wrinkling. If the picture is a photograph, it should be ironed out smooth with a hot iron and then trimmed. Mix a little gum arabic in hot water, so as to make a rather thick mucilage. Place the picture on the page in position and mark just inside the corners. Remove the picture and take some of the mucilage on a ruling pen and draw a heavy line of mucilage from one point to another, so as to make a line of mucilage all around the place where the picture is to be. As soon as the mucilage is sticky put the picture in place and a book over it to keep it flat. When dry, you will have a smooth mount that will not curl.