

candles employed at the Victoria station of the Metropolitan Railway and on Waterloo Bridge. A 20 horse power engine already sustains 60 lights (of from 500 to 700 candle power), and 80 lights are promised when another couple of Gramme machines are put down. The length of cable used is upward of a mile and a half, the length of the circuit over three and a quarter miles. It is claimed that the limit of the power of the engine has not been approached. The light already furnished exceeds 1,500 wax candles to the horse power; and yet the margin for improvement is enormous. The actual energy of the coal used is not less than eight times that really developed as light.

In still another direction—the development of thermo-electricity by direct solar radiation, by the utilization of the waste heat of our fires, and the like—the possibilities are incalculable and the work of invention but scarcely begun. In the near future, too, men will draw upon many now neglected sources of power, which will give them through the mediation of electricity a greater supply of motive force than is now derived from all our coal mines. In a recent issue of the SCIENTIFIC AMERICAN SUPPLEMENT the progress made in the utilization of electricity as a carrier of power economically developed in large engines operated by steam power, waterfalls, and the like, was described at great length by Professor Ayrton.

The transmission of power by electricity both for short and for long distances, is not only practicable but economical; and the sanitary and other advantages of drawing power from a distance, for small manufacturing and for operating domestic machinery, are so enormous that the new system is sure to work great changes in all branches of industrial affairs. In every department of life this most nimble and willing servant of humanity is becoming useful, or rather men are beginning to discover how infinite is his capacity for usefulness and the marvelous economies possible throughout his employment. He is as ready to work for us as to run our errands, or watch our property against thieves and fire. And it is no stretch of imagination to say that our children if not ourselves will see the small steam engine everywhere displaced by the electric motor, which will convert into motive power the subtle energy conveyed by wires from central sources of energy—huge furnaces constructed on the most approved scientific principles, out of the way waterfalls, tidal currents, even the sun himself. And doubtless this cleanly and trusty servant will serve humanity in ways we do not dream of now, and at a cost that will be, by comparison with the present cost of light and heat and working energy, almost nominal.

TWO MORE PATENT BILLS.

Two bills to amend the patent laws were introduced in the House of Representatives, December 18, and numbered respectively 3,039 and 3,041.

The first, by Mr. Vance, of North Carolina, provides that any one of the joint owners of any patent for an invention may grant a license to use the invention, but not exclusively, except under the following conditions: (1) When the conveyance or other instrument creating the joint ownership (recorded in the Patent Office before the execution of the license) provides that no license shall be valid unless executed by all the owners, or a specified portion of them in number or interest; or (2) when the joint owners have previously made an agreement limiting the power of the individual owners to grant licenses, and have had the agreement recorded in the Patent Office. The bill further provides for the recording of such powers of attorney, agreements, and the like in the Patent Office, and the use of certified copies of such papers in evidence, as is now done in the case of records of assignments. So far as appears the proposed amendment seems likely to be beneficial.

Not so much can be said of the bill introduced by Mr. Young (H. R. 3,041). Hitherto the American patent laws have wisely regarded inventors as the only parties entitled to the protection guaranteed by letters patent. Mr. Young proposes to extend the protection to those who introduce inventions from foreign countries; but (apparently) only under the curious condition that the art or process to be patented shall have been "used or practiced, unpatented, for the period of fifty years last past exclusively in the country where obtained."

Possibly this is the very thin end of a wedge designed to open our Patent Office to the class of operators known in Europe as "patent sharks," who watch the records of the patent offices of other countries for promising inventions which they immediately proceed to patent as introducers—a sort of industrial piracy which has not been and we trust never will be encouraged in this country.

It is more probable, however, that the parties for whom Mr. Young is working are interested in some art established in a country where patents are not granted—an art which they wish to introduce and monopolize here, or, what is quite as likely, one which they wish to keep from being practiced among us. Under a law such as he proposes any distinctively Asiatic, African, Swiss, Turkish, or South American art, and a wide range of arts which have been practiced too long in either of the several countries of Europe which issue patents to have ever been brought under the action of patent laws, could be patented here, either to work or to suppress. The propriety of granting such great privileges for nothing, or worse than nothing, is not obvious, to say nothing of the probable lack of constitutional authority for such a departure from the principle on which our patent laws are based.

THE TAY BRIDGE DISASTER.

The mails bring no conclusive explanation of the terrible railway disaster at the Frith of Tay. The hypothesis suggested as the most probable, in view of the meager telegraphic account of the disaster—namely, that the bridge was bodily blown away—still seems the most probable. The only point cleared up by the divers is that both the bridge and the train fell together, and that the train had entered upon the fourth span from the south end of the gap before the bridge was overturned. The disaster occurred where the sides of the iron lattice girders rose above the level of the track.

The hypothesis of the constructing engineer of the bridge, Sir Thomas Bouch, is that when the train reached the fatal spot it was tilted over against the girders by a sudden gust of wind, the girders gave way under the strain, and the whole structure broke down under the combined impact of train and storm. This is the best face that can be put upon the terrible affair; not a few engineers, however, are of opinion that the extreme height and narrow base of that portion of the bridge afford a sufficient explanation of its inability to withstand the pressure of the gale. It is certain that the stability of the bridge under the stress of high wind has more than once been seriously questioned. It is even said—though the evidence is not conclusive—that a leading firm, to whom the contract for the construction of the bridge was first offered, declined to undertake it on the ground that a bridge on the plan contemplated could not be made secure. The policy which dictated a single track, and therefore a high and narrow bridge, for such a crossing, proves to have been terribly the reverse of economical.

THE PAST YEAR'S WORK IN THE PATENT OFFICE.

For the first time, the year's work of the Patent Office shows a falling off, due undoubtedly to the attempt in Congress last winter to change the law to the injury of inventors. The determination expressed by inventors at the time to withhold applications for patents until assured that their rights would not be laid open to invasion by so doing, thus shows itself. The larger decrease in the number of patents issued may be due in part to the diminished means of the office through the reduction of the appropriations, which reduction, the Commissioner says, has been carried so far as to seriously cripple the office and injure the public interests. The completion and wide distribution of photolithographic copies of the drawings of American patents granted prior to November 20, 1866, and the distribution of English patents for reference in the Examiners' rooms, have aided to a considerable extent the Commissioner thinks, in reducing the number of patents issued.

The statistics of the office for the year ending June 30, 1879, are as follows:

The number of applications for patents was 19,300, being 357 less than the previous year. The number for design patents was 697; for reissue, 639; for registration of trade marks, 1,465; for registration of labels, 631; caveats filed, 2,674.

The number of patents granted, including reissues and designs, was 12,471, being 1,629 less than the previous year. The number of trade marks was 1,144; labels registered, 403; patents withheld for non-payment of final fee, 828.

The total receipts of the office were \$703,146.79, being \$31,741.19 less than those of the previous year.

The expenditures for the year were \$548,651.47. This includes \$5,000 appropriated for the repair of models damaged by the fire, and is not properly chargeable to the current expenses of the office.

The expenditures for the previous year were \$665,906.02; \$50,000 of this being for the repair of models. Excluding the amount appropriated for the repair of damaged models in both years, the current expenditures of the office were \$72,254.55 less than those of the previous year. The excess of receipts over expenditures was \$154,495.32.

This excess the Commissioner pronounces an unjust tax upon inventors, and favors its reduction either by exacting lower fees or by expending the surplus in improving the facilities for transacting the business of the office. He recommends the latter course. He calls attention to the inadequacy of the rooms provided for the use of the office, and, after insisting that the office needs and ought to have exclusive possession of the entire building, excepting the rooms of the Secretary of the Interior, he recommends that temporary accommodations be provided in that portion of the building now being reconstructed.

The Commissioner further asserts that the interest of the service demands an additional force of clerks and examiners, and to this end he recommends that provision be made by law for ten additional clerks of class one, three of class two, two of class three, one of class four, and fifteen assistant examiners. He suggests also that a portion of the surplus revenues of the office be used annually for the purpose of making additions to the technical library of the office, and for increasing the compensation of the clerks and employes, who, while forced to remain in the lower grade because of inadequate appropriations, are showing efficiency entitling them to higher pay.

Touching the present system of requiring and preserving models the Commissioner makes the pertinent remark that it cannot be permanent, and steps toward a change ought to be taken at once. At the present rate of accumulation there will be more than two million models to house before our second Centennial year, requiring fifty halls as spacious as those now used for storing models. In a few more centuries the entire Federal District would be inadequate to the storage

of these evidences of American inventiveness. At the present time models are actually used in the examination of about 50 per cent of the cases in which models are filed. With proper scale drawings from working machines by far the larger part of the models now used might be dispensed with. The Commissioner, therefore, recommends as a first step toward getting rid of models that the following statutory provisions be enacted:

1. That no model shall be required or filed in any case, unless upon a written certificate filed in the case by the examiner in charge of the division to which the invention pertains that it will be useful in the examination of the application, or upon the special order of the Commissioner.

2. That the Commissioner shall not require the production of a model for the examination in any case in which the applicant shall furnish satisfactory scale drawings, made from a working machine, and shall produce for examination a working machine in operation in the city of Washington.

3. That upon the expiration of every patent the model pertaining thereto shall be sent by the Commissioner to one of the public institutions of science and art in the United States.

The only exception that can be taken to these recommendations is, perhaps, in connection with the third. The final disposition of the model might properly be left to the option of the inventor.

To obviate the risk of accidental or fraudulent alteration of models in the manufacture of copies of models for official certification, the Commissioner recommends the enactment of a law authorizing the employment for this purpose of skilled workmen, who shall take the oath of office and give bonds for the faithful performance of their duty.

The Commissioner further recommends that a law be passed authorizing the execution by United States commissioners, or other United States officers, of commissions issued by foreign governments to take testimony in the United States to be used before foreign patent offices and before all judicial, legislative, and executive departments of foreign governments, and to punish perjury committed in such testimony; the law to be operative only in favor of such governments as shall make like provision for taking testimony in foreign countries, to be used in like manner in the United States.

Also that the law relating to the payment of the final fee within six months of the allowance of a patent be so amended as to make the execution of the law possible in all cases. Under the present law, requiring a patent to be dated within six months of its allowance, the payment of the fee on the last day of the prescribed time makes it impossible to conform to the law without resorting to the fiction of a new allowance, made upon payment of the final fee too late to admit of the preparation of the patent before the expiration of the six months. The extension of the time, within which a patent may be dated, to seven months from the date of its allowance would obviate the present difficulty.

German Professors.

In the German universities the professors are men who have distinguished themselves by their contributions to science. They have usually begun their career as "privat docenten," or private teachers, a position unknown in America. If successful, they are made professors extraordinary, and of these a few only reach the distinction of professor ordinary. Any young man of promise, who has obtained the degree of doctor of philosophy (Ph.D.), with honors, can obtain permission to lecture in a given university, provided he passes a good examination in the subject that he intends to lecture on. The university gives him a room to lecture in, and if he succeeds in securing any listeners he gets their fees; beyond this he takes care of himself. His income depends entirely upon his popularity. If his lectures are good, and he proves his ability, his success is assured. In a few years he is called to a vacant chair in the same, or oftener in another, university, where he holds the position of extraordinary professor for years, often for life.

The following list of professors of chemistry in the principal German and Swiss universities embraces many distinguished men whose names are familiar in this country. The figures annexed give the ages of these men, and, as the *Journal of Applied Chemistry* says, they show that most of them are no longer "mere boys." Berlin, A. W. Hofmann, 61; Bonn, A. Kekulé, 50; Breslau, C. J. Loewig, 76; Erlangen, J. Volhard, 45; Giessen, H. Will, 67; Göttingen, F. Woehler, 79, H. Huebner, 42; Halle, W. Heintz, 62; Heidelberg, R. Bunsen, 67, H. Kopp, 62; Jena, G. A. Geuther, —; Königsberg, W. Lossen, 41; Leipsic, H. Kolbe, 61; Marburg, Th. Zincke, 39; Munich, A. Baeyer, 44; Strassburg, R. Fittig, 44; Tübingen, Lothar Meyer, 49; Würzburg, J. R. von Wagner, 57, J. Wislicenus, 44; Zürich, V. Merz, 42.

The oldest of these, Professor Woehler, no longer lectures. He will celebrate his eightieth birthday on the 31st of next July.

Dead at His Post.

A singular, but fortunately not a common, danger of travel was illustrated on the Fulton Ferry, between New York and Brooklyn the other day. A boat was in the slip on the Brooklyn side, and for a few minutes the deck-hands waited, wondering at the unusual delay in starting. Finally two of them mounted to the pilot-house and there found Wm. A. White, the pilot, on the floor, just dead. He had died of heart disease just as he was ready to sound the signal to start the engine. Had he fallen while the boat was in the middle of the crowded river, a very serious accident might have followed.