tained in fruit, rice, bread, biscuits, and vegetables, their customary food in the absence of their favorite bananas.

A specimen of an allied species, *c. Livingstonii*, was brought to England by Mr. Monteiro, who describes it as beautifully tame and gentle. It was most amusing in its habits and in the notice it took of everything around it. A change of dress, or even a new ribbon, excited its attention greatly. It would utter a loud cry and open out its lovely wings in astonishment, and, coming close to the bars of its cage, examine the new decoration with the liveliest curiosity. It was very fond of looking at pictures, especially brightly colored prints. At night it roosted in a little flat basket, in which it showed a child-like reluctance to nestle until it was sung to for a few minutes, when it would utter a satisfied sort of low rumbling noise, squat down, and go quietly to sleep.

The wild birds display their observing and extremely inquisitive disposition by running along the large branches of the trees in an excited and fussy manner, with outstretched neck and expanded wings, peering down on any intruder with every expression of interest. The natives believe that these demonstrations are intended to give travelers warning of danger from wild beasts and robbers.

THE COST OF MOTHS AND MILDEW.

A very striking illustration of the value which often attaches to a patent for a comparatively small invention, especially when the introduction of the same is skilfully managed, may be found in the large sums paid by our government for the use of a process for preventing moth and mildew in army clothing. The aggregate amount made thus far by the fortunate inventors, we do not exactly know; but in the Quartermaster General's report for 1874, the following passage occurs: "The expenditures on account of the moth and mildew proof process of Cowles & Co., during the fiscal year, have been $350,000. This includes $200,000 appropriated for the current fiscal year, but made available for expenditure during the last fiscal year." To prepare articles not yet treated, an additional appropriation of $100,000 is asked; but this subsequently was cut down in Congress to $50,000. The patent was granted, September 20, 1864, to George A. Cowles, Jesse P. Case, and Victor Vieron, of New York city, and is based on the preservative action of sulphate of copper on vegetable fibers. By the addition of alum, the preserving qualities of the mixture are, it is claimed, greatly enhanced; and when gelatin is also combined, the fibers are said to be not only proof against decay, but also impervious to water. The ingredients are: Alum, 2 lbs., dissolved in 60 lbs. of water; blue vitriol, 2 lbs., dissolved in 8 lbs. of water; to which is added gelatin, 1 lb., in 30 lbs. of water. A still further improvement is said to be effected by acetate of lead, ½ lb., dissolved in 30 lbs. of water. The solutions are all hot, and separately mixed, with the exception of the vitriol, which is added cold.

The circumstances attending the adoption of, and the continued royalty paid for, this process, are soon, we learn, to be made the subject of Congressional investigation, it being alleged that the compound is valueless as a preservative, and that some officials have acted fraudulently with regard to it. Whether these charges are substantiated or not, the fact nevertheless remains that the government is out of pocket some $400,000, and that the patentees or managers of patents are the gainers of a very large sum of money. The actual value of a process which will effectually destroy moth and prevent mildew in cotton or woolen goods would be great, even if the particular process now in question proved worthless. The simple fact of such large amounts having been paid for the use of the patented process in a single article conveys some idea of what may be realized by the inventor of any other process for like purposes which can be proved to be really efficient, especially if he be lucky enough to find in the government so liberal a patron.

THE POWER OF BOILERS.

Our readers must have observed the many questions on this subject that occur in our correspondence columns; and it may have seemed curious to them that, while nearly every manufacturer talks of the horse power of his boilers, we have invariably replied that we were unable to define the term, or furnish any standard rules relating to it. We think, however, that we can give good reasons for the position that we have assumed. It is evident that, if we wish to measure anything, we must have some unit of comparison in which the measurement may be expressed. It is easy to determine the length of a piece of cloth in inches or yards, because these are standard units, fixed by law. But if every manufacturer of cloth used a measure of his own which he called at pleasure a yard or an inch, without regard to its actual length, it is clear that a general expression like two yards of cloth would not have any definite meaning; and if we wished to speak of yards, it would be necessary to specify what particular yards were meant: so that it might be said, for instance, that 5 of Mr. A's. yards of cloth were the same as 10 of Mr. B's. We shall show directly that this is about the way in which we have to compare boilers rated by different makers. Any one who has looked over the catalogues of steam engine builders has doubtless noticed that different makers do not have the same idea about horse power; so that an engine may be rated in one list as 5 horse power, while another maker may rate one of the same size at 10 horse power. Fortunately, the term horse power, as applied to a steam engine, has an arbitrary meaning; and if an engine is sold under the guarantee that it shall develope a certain amount of useful horse power, all engineers will agree upon the meaning of the guarantee. When there was little difference in the details of engines, it usually happened that a boiler large enough to furnish one engine with steam would answer for any engine of the same dimensions; and as each of these engines would develope about the same amount of power, it was usual to speak of a boiler as being of such a horse power, meaning thereby that it would furnish steam for an engine of that horse power. Having found by experiment the proper size of boilers for engines of different dimensions, the builders were enabled to construct empirical rules, and to say that, for each horse power that the engine was to develope, a certain weight or volume of water must be evaporated by the boiler per hour, requiring a definite amount of heating and grate surface. In those days, a boiler of 10 horse power, for instance, was one that would furnish steam for a 10 horse engine; and as the performance of such engines varied but little, the term had a tolerably definite meaning. In the course of time, as improvements were introduced, it was found that the size of a boiler was not always a measure of its efficiency, and that different engines were operated with widely varying measures of economy. It became common, also, to employ boilers for such purposes as heating, in which it was difficult to estimate the effect in horse power. Another disturbing cause arose from the fact that, as the demand for machinery extended and new manufactories were started, under the competition of the trade it was not uncommon for makers to change the old rating, so as to induce their customers to believe that they were getting more for their money. Now if Mr. Smith, who keeps a dry goods store, were to assume that a yard was only 2 feet, and offer to sell 12 yards of calico for the same price that Mr. Jones, who uses a standard yard stick, asks for 8 yards, very few people would be imposed upon, and probably an inspector would make things unpleasant for Mr. Smith. But it is very common for Mr. Robinson, who is a boiler maker, to decide that 10 feet of heating surface per horse power is a good proportion for a boiler, and offer a 15 horse power boiler for the same price as Mr. Brown's 10 horse boiler, which has 15 feet of heating surface per horse power. If any one will compare a few price lists of boilers, he will find just such anomalies as this; and will probably conclude that the size of a boiler will not enable him to express its power, for the reason that he has no standard by which to measure it. If he extend his inquiries a little farther, he will find engines developing precisely the same power, but requiring boilers of very different size and efficiency, for the reason that one engine may be much more economical than another. Experience shows, for instance, that there are some engines which require the evaporation of more than 100 lbs. of water per hour for each horse power, while others need less than 20, which sufficiently demonstrates the impossibility of rating the standard power of a boiler by connecting it to any engine, taken at pleasure, and measuring the horse power developed. It is evidently unfair to make a good boiler suffer for the faults of a wasteful engine—and the number of engineers supporting our view of the matter is daily on the increase—this view, briefly expressed, being that the proper method of estimating the power of a boiler is to measure the quantity of water which it can evaporate in a given time, as, for instance, an hour. Now if feed water is supplied to one boiler at a temperature of 60°, and the steam pressure is 100 lbs. per square inch, while the feed water of another boiler is 120°, and the steam pressure only 50 lbs., a pound of water evaporated in the first boiler must have more heat imparted to it than a pound in the second boiler. In a third boiler it may be still different; and in order to make a fair comparison between different boilers under various circumstances, it is necessary to reduce the evaporation of each to a common standard, the standard usually chosen being the equivalent evaporation that would have taken place if the temperature of the feed had been 212°, and the pressure of the steam the same as that of the atmosphere. A simple manner of making this reduction was explained a short time ago in the SCIENTIFIC AMERICAN (page 225, volume XXXIII). In measuring the evaporation of any given boiler, it is to be remembered that in some boilers water is carried over with the steam; and unless its amount is determined, the evaporation will be overestimated. A purchaser who buys a boiler measured on the basis of its actual performance knows exactly what he is getting for his money; but it seems desirable to many that some unit should be fixed upon, so that the performance can be expressed in horse power. Such a rating would undoubtedly be convenient in many respects; and the value of the unit does not appear to be a matter of much importance, but it seems difficult for engineers to come to an agreement in this respect. A few years ago a committee was appointed by the Franklin Institute to fix upon a standard for the horse power of a boiler. After long deliberation, they presented two reports. All the members of the committee agreed that the true measure of a boiler's power was its actual performance, or its equivalent evaporation of dry steam, from and at 212°. A portion of the committee considered that the proper measure of a horse power was the equivalent evaporation of one cubic foot of water per hour, while the remainder stated that they were unable to agree upon any standard. The report of this committee contains much valuable information in regard to the practice of different makers in proportioning boilers.

The most recent publication upon the horse power of boilers is a little pamphlet by Mr. Nystrom, which has already been briefly noticed in our columns. Mr. Nystrom claims to have established the legal definition of the horse power of a boiler, because his explanation is in accordance with the law of dynamics, and is not contrary to the law of the land. Without discussing this point, it is sufficient to say that Mr. Nystrom's definition, however legal it may be from his point of view, is certainly not legalized, and consequently only adds one more to the assumed standards, which are already too numerous and confusing. His method may be briefly illustrated as follows:

A cubic foot of water, when evaporated, forms a definite volume of steam, corresponding to the pressure; and if we take the product of: 1. The number of cubic feet of water evaporated per hour. 2. The increase of volume of each cubic foot of water, by its conversion into steam. 3. The pressure of the steam, in lbs. per square foot: and divide this product by 1,980,000, the quotient, which is the greatest power this steam can develope in a non-condensing engine, without expansion, is the horse power of the boiler. Suppose, for example, that a boiler evaporates 25 cubic feet of water per hour, and that the pressure of the steam above the atmosphere is 130 lbs. per square inch, or 18,720 lbs. per square foot. The relative volume of steam of this pressure is 192·83, so that the increase of volume for each cubic foot of water, on its conversion into steam, is 191·83 cubic feet, and the horse power of the boiler is the product of 25,191·83, and 18,720 divided by 1,980,000, or 45·3 +.

Mr. Nystrom gives a formula for reducing the observed evaporation to equivalent evaporation from feed water at 32°. He states, as we understand him, that the correct determination of the quality of the steam is impossible in the present state of our knowledge, and consequently his rule is defective, basing the rating of a boiler upon its apparent evaporation, uncorrected for priming or superheating. Of course engineers who think that they are able to make these corrections can readily introduce them into Mr. Nystrom's formulas; but they will probably find that the method previously stated, of basing estimates of power upon the equivalent evaporation from and at 212°, is preferable, on many accounts.

THE PAY OF THE PATENT BUREAU.

The policy of reducing the salary of office holders, generally, which has occupied considerable attention in our present Congress, we do not intend to discuss; but we agree with the sentiments of a Washington correspondent of the New York *Tribune* in the opinion that a generous policy should be pursued by Congress toward the Patent Office, which not only is self-supporting, but has acquired a large surplus fund. The inventors pay all the expenses of this department; it costs the government nothing to run it; and it would be poor policy to reduce the expenses attending its management if inferior talent is to take the place of the present efficient Commissioner and his force of assistants, which will be the natural result. Inventors were never more active than now; and it would be a bad commentary on our Centennial year if any steps should be taken to lessen the enthusiasm of our great body of inventors, to whom is due so much of our nation's progress.

R. H. Duell, Commissioner of Patents, thinks, states the same correspondent, that it will be very unwise to cut down the expenses of a self-sustaining bureau like his. He says that the United States Patent Office has long had a large annual surplus, that its business is increasing, and that there is no reason apparent for reducing either the number or pay of its officers. "The work of the office requires special training; even with the present pay, it is not possible long to keep in government employ many of those best fitted by talent and experience for the duty; the credit of the office and the interest of inventors, whose money supports the office, and of manufacturers, whose capital to the extent of many millions is involved in patents, are imperiled by inefficient work; and the increased number of patents and the general progress of the arts render the proper examination of applications each year more difficult. The erroneous issue of a single patent may easily involve the loss of ten times the amount of the yearly pay of an examiner. These examiners are not only to grant patents, but to see that none are improperly granted. Inventors pay to the government more than enough to afford the small pay now allowed. To take possession of this fund, and then furnish half paid (and consequently poor) service, seems like a fraud on inventors. Should the proposed reduction be made, it will be impossible to keep up the business of the Office." The receipts from applications for patents have run up from $703,191.77 in 1873 to $743,453.36 in 1875, and the surplus last year was $21,795.65. The appropriation for 1875 6 was $436,400; the House bill proposes to cut down the appropriation to $370,220, and the working force from 351 to 294.

Black Varnish for Iron.

A durable black and shining varnish for iron is made by adding to oil of turpentine strong sulphuric acid, drop by drop, stirring until a sirupy precipitate is formed, and no more of it is produced on further addition of a drop of acid. The liquid is now repeatedly washed with water, until the water exhibits no more acid reaction. The precipitate is next brought upon a cloth filter, and after all the water has run off, the sirupy mass is fit for use. This is painted over the iron with a brush, being previously diluted with oil of turpentine, in case it does not flow well. Immediately afterward, the paint is burnt in by a gentle heat, and, after cooling, the black surface is rubbed with a piece of woollen stuff dipped in linseed oil. This varnish is said to combine chemically with the metal, and does not wear or peel off.

SOME idea of the immense slaughter of buffaloes which yearly takes place on the plains and which is rapidly leading to the total extinction of that animal, may be gleaned from the fact that seven cars freighted with buffalo bones recently arrived in this city. The material will be worked up into buttons, knife handles, etc.