

quantities from the Guadiana River, Fort Formosa, in Portugal, from mines which were worked by the Romans, and it is used extensively for making sulphuric acid in London, Newcastle, Bristol, and other places. This is an excellent instance of the successful and economic employment of a material in the arts and manufactures which was till lately, and in many places still is, a nuisance over extensive tracts of country. The smoke in a very modified condition occurs in all large towns, where much coal is burned and especially in manufacturing towns where the coal is often of inferior quality. In such towns, by the mere burning of the sulphur in the coals, many gallons of sulphuric acid must be formed, and in rainy weather be washed down on the people."

REPORT OF THE COMMISSIONER OF PATENTS

U. S. PATENT OFFICE, January, 1866.

SIR:—In accordance with the provisions of the fourteenth section of the act approved March 3, 1837, I have the honor to submit the following report of the operations of this office during the year 1865.

The receipts and expenditures of the office for the year, and the condition of the patent fund at its close, will be seen by a glance at the following statements:—

No. 1.	
Number of applications for patents during the year	10,661
Number of patents issued, including reissues and designs	6,616
Number of caveats filed during the year	1,937
Number of applications for extension of patents	78
Number of patents extended	61
Number of patents expired, Dec. 31, 1865	914
Of the patents granted there were:—	
To citizens of the United States	6,428
To subjects of Great Britain	82
To subjects of the French Empire	40
To subjects of other foreign governments	66

No. 2.	
Statement of money received during the year, namely:—	
On applications for patents, reissues, etc.	\$321,572 20
For copies and for recording	7,219 64
Total	\$328,791 84

No. 3.	
Statement of expenditures from the Patent Fund:—	
For salaries	\$100,032 54
For contingent expenses	75,244 43
For temporary clerks	97,453 37
For withdrawals	420 00
For refunding money paid by mistake	649 00
For Judges in appeal cases	400 10
Total	\$274,199 34

No. 4.	
Amount to the credit of the Patent Fund, Jan. 1, 1865	\$51,592 28
Amount of receipts during the year	345,791 84
Total	\$407,384 12
From which deduct for expenditures	274,199 34
Leaving to the credit of Patent Fund, Jan. 1, 1866	\$130,184 78

Surplus of receipts over expenses.....\$74,592 50

The unprecedented activity of the mechanical industry of the country since the close of the war for the suppression of the rebellion is strikingly manifested by a comparison of the business of this office for the last year with that of the previous years since the organization of the office:—

TABLE EXHIBITING THE BUSINESS OF THE OFFICE FOR TWENTY-NINE YEARS, ENDING DEC. 31, 1865.

Years.	Applications filed.	Caveats filed.	Patents issued.	Cash received.	Cash expended.
1837	10	1	437	\$29,284 08	\$33,506 98
1838	10	1	520	42,123 64	37,402 10
1839	10	1	425	37,260 00	34,543 51
1840	765	298	473	38,036 61	39,020 67
1841	847	312	495	40,413 01	32,666 87
1842	751	291	517	36,505 68	31,241 44
1843	819	315	531	35,315 81	30,768 96
1844	1,045	381	502	42,509 26	35,344 73
1845	1,246	452	502	51,076 14	39,345 65
1846	1,272	448	619	50,264 16	46,158 71
1847	1,531	553	572	63,111 19	41,878 35
1848	1,628	697	600	67,576 69	55,305 84
1849	1,955	695	1,070	80,752 78	77,716 44
1850	2,193	602	985	86,927 05	80,109 95
1851	2,254	700	861	95,738 61	86,916 93
1852	2,639	996	1,010	112,056 31	95,916 91
1853	2,674	901	958	121,527 45	132,869 83
1854	3,321	838	1,902	163,789 84	16,146 32
1855	4,435	903	2,024	216,459 25	179,540 33
1856	4,960	1,021	2,502	192,588 02	199,131 02
1857	4,771	1,010	2,910	198,132 01	211,582 09
1858	5,361	943	3,710	208,716 16	193,193 74
1859	6,225	1,097	4,538	215,942 15	210,278 41
1860	7,633	1,084	4,819	246,352 69	252,820 80
1861	4,643	700	3,349	137,354 44	231,491 91
1862	5,038	824	3,541	215,754 99	182,810 39
1863	6,014	787	4,170	195,693 29	189,414 14
1864	6,972	1,063	5,020	240,919 98	229,568 00
1865	10,661	1,977	6,616	348,791 84	274,199 34

It is here seen that the number of applications for patents received in 1865 exceeded, by nearly forty per cent, the number filed in any previous year, and the number of caveats filed exceeded those of any previous year by more than seventy-five per cent. The number of patents issued exceeded those issued in 1864, the highest previous year, by more than thirty per cent.

The receipts into the patent fund exceed those of any former year by more than thirty-six per cent, while the expenditures were only increased a trifle over eight per cent, and a considerable surplus is left to the credit of the patent fund. If the cases brought to the attention of the Office continue to be as numerous as at present, it will become necessary to make such additions to the examining and clerical force of the Office as will absorb a portion of the surplus earnings; while, on the other hand, if the anticipated resumption of specie payments should be attended with any general financial prostration, the receipts of the Office would undoubtedly fall below the rate of the present expenses.

When the Patent Office was first established as a

separate Bureau, in 1838, the act provided for the appointment of a single examining clerk. The number has been increased by additional legislation, at successive periods, until, by the act of March 2d, 1861, the limit was fixed at sixteen examiners and the same number each of First and Second Assistant Examiner.

As will be seen by a reference to the comparative table given above, there was a material reduction in business of the Office immediately after the passage of the act just referred to, and it was found unnecessary until recently to appoint the full number of examiners allowed by law. But so rapid has been the increase of inventive activity, that it is now found impossible to prevent the examinations falling largely in arrears.

The number of applications in the hands of the examiners at the close of the year, on which no action had been taken, was 1,134.

I would therefore recommend that authority be given for the appointment of four additional officers of each of the several grades. If their services shall be found necessary to the examination of the applications presented.

By the act of May 27, 1848, the salary of the Examiners was fixed at twenty-five hundred dollars per annum, and by the act of March 3, 1855, that of the First Assistant and Second Assistant Examiners, was fixed at eighteen hundred dollars, and sixteen hundred per annum, respectively. The position of First Assistant Examiner is one of great importance and responsibility, as he is frequently called upon to decide upon the merits of applications in the absence of his principal, and it is also of almost daily occurrence that the pressure of work will be such as to force the Examiner to reply mainly upon the judgment of his Assistant. I am satisfied that the interests of the Office and of inventors generally would be promoted if the salary of the First Assistant Examiners were raised to two thousand dollars.

I would also most respectfully urge that the salary of the Librarian be raised to twenty-five hundred dollars per annum, the sum now paid the examiners. The library now contains upward of 15,000 volumes, exclusive of some 1,500 volumes temporarily in the rooms of the Agricultural Department. Although the number of volumes is not so large as may be found in many other public libraries, the works are almost exclusively of a scientific and technological character, and it is doubtful if there is another library in the country which is so nearly complete in all the departments of practical knowledge. During the past year rather more than 1000 new volumes have been placed upon the shelves, while the expenditures, exclusive of the sums paid for the binding and transportation of the specifications and drawings of English patents so liberally presented to the Office by the Great Seal Patent Office of England, have been less than \$500.

The library is constantly visited by inventors from all parts of the country, as well as by persons engaged in the various branches of scientific investigation, and it is requisite that the Librarian shall be a man of broad culture and familiar with the contents of all the works under his care, as these cover the whole domain of practical science, it is manifest that the salary of the Librarian should be at least equal to that of a principal examiner.

In addition to the examining corps, the administrative and financial business of the Office requires a considerable force of clerks who are distributed into several divisions such as experience has shown to be most conducive to the rapid performance of the work.

I think there can be no doubt of the propriety of having each of these divisions under the charge of a clerk of the highest regular grade, and I would therefore recommend that authority be given for the appointment of six clerks of the fourth class.

The disbursing clerk is now ranked as a clerk of the fourth class. All money's received or expended by the Office pass through his hands, and he is held responsible for the accuracy of his accounts.

I can see no reason why his salary should be less than that generally paid to the disbursing clerks in the several executive departments, and I would recommend that his salary be fixed at two thousand dollars per annum.

The act of March 2, 1861, provided for the appointment of a Board of Examiners-in-Chief whose duty it should be to revise and determine upon the validity of decisions made by examiners when adverse to the grant of Letters Patent. An experience of five years has fully confirmed the wisdom of the enactment, but it has, at the same time, demonstrated the necessity of additional legislation upon the subject. While a fee of twenty dollars is charged upon an appeal from the Examiners-in-Chief to the Commissioner, no charge is made for an appeal from the examiners to the Board. It results from this that appeals are taken in many cases without a shadow of ground, and in contested cases, merely for the purpose of delay. During the year 1865, there were 493 appeals taken to the Board, of which number 166 remained undisposed of at the close of the year. If a fee of ten dollars were charged on appeal to the Board, it would check the number of frivolous appeals and would be gladly paid by those inventors who are confident of the justice of their claim, as they would recognize it as securing them an early decision in place of the delay of months to which they are now so generally subjected.

After consultation with many inventors and with solicitors in extensive practice, I am satisfied that the proposed amendment would be received with almost universal favor.

The published reports of this Office, with the descriptions and illustrations of patented inventions, are not only of great value to inventors and the country as indicative of the directions in which mechanical and scientific skill is pushing its way into new channels, but their general diffusion effects a very important reduction in the labor to be performed in this Office. By a study of the report, one who has perfected an improvement in some useful machine, is in many instances enabled to see at once whether his invention is novel, and if so, the particular feature which has never been the subject of a patent. Again, when an existing patent is referred to by the Office as a reason for the

rejection of an application, the applicant is saved the time and expense required to obtain a copy of such patent, by its publication in the annual report. This is especially true of the latest reports, inasmuch as when a necessity is felt by the public for an improvement in some particular art or manufacture, the ingenuity of inventors in different parts of the country is stimulated into activity in that particular field, while at another period the excess of activity is turned into other paths.

This period of two years is recognized in several instances as the measure by which the rights of an inventor shall be determined, and I am convinced that if the same idea is extended to another case, not now within its scope, the occasion for much serious injustice will be removed. Under the existing law a patent is taken out in which the inventor makes a clearly defined claim to a particular feature.

The claim, it may be, does not cover all that is described in the specification or shown in the drawing, and whatever is thus left unclaimed may be used by any person unless protected by a previous patent. Some enterprising manufacturer, who is keen enough to recognize the value of that which the inventor did not deem it worth his while to appropriate, invests his capital and begins to furnish the public with a valuable article, and after this the inventor applies for a reissue of his patent and an extension of his claim, so as to give him the monopoly of that which he had before left open to the use of the world. If it appears upon examination that the original specification described the art or device in question, and that the holder of the patent was actually the original inventor, he is entitled to a reissue in such terms as to preclude the use of such device, except upon such conditions as he may grant. It would not be difficult, in this manner, to entrap a person into such an arrangement of his business, or employment of his means, as to leave him at the mercy of the inventor or to compel him to pay an exorbitant royalty, when the patent is reissued with a broader claim. In my opinion it would be a judicious amendment of the law and would prove an effective safeguard to the rights of innocent parties, if the privilege of reissuing a patent in such terms as to broaden the claim were restricted to the first two years of the life of a patent, bearing reissues for other purposes to be granted at any time, as at present.

The act of 1861 allowed applicants to pay a portion of the fee required for the issue of a patent at the time of making application, and the remainder at the convenience of the inventor whenever he might desire the patent to be engrossed. As it was found that many patents were allowed to lie indefinitely, it was further provided in 1863, that if the final fee were not paid within six months after the patent was passed and allowed, the invention should become public property as against the applicant. In 1865 it was further enacted that any person who fails to pay the final fee within the time limited, may make a new application for the same invention at any time within two years from the date of the allowance of the original application. Under this state of the law, cases have been brought to the attention of the Office in which inventors have been unable to pay the fee within six months or to file a new application within two years from the date of the allowance of their application by reason of absence from home in the service of the United States. To confiscate the property of an inventor because he has imperilled his life for the sake of his country, is so glaringly unjust that it needs but to be mentioned to secure the adoption of a remedy. I would suggest that whenever it be made to appear to the satisfaction of this Office, that a failure to pay this final fee, or to renew an application within the time limited by law, has been due to the absence of the inventor from home on duty in the army or navy of the United States, the forfeiture shall be set aside and the patent issued.

The labor of the Office is much increased on account of the delay which has recently attended the publication of the annual reports, and the value of the reports to the public is much diminished by the late day at which they make their appearance. The heavy pressure upon the public printing office, occasioned by the increased business of all the executive departments growing out of the war which has now been happily terminated, has been one cause of the delay; and if this were all, it would not be expected that this Office should complain. But the most serious obstruction to an early issue is found in the state of the law, or rather, I might say, in the absence of any law on the subject. Although it has long been the settled practice of the Government to publish the list of patents with the illustrations, there is no law authorizing such publication except as the printing of each report is ordered after the same is submitted to Congress. Some time must then elapse before a contract can be made with the engravers, and it is usually April or May before the engraving can be commenced upon the patents of the previous year. It is worthy of consideration whether authority might not be given in advance for the preparation of the plates, so that the drawings could be placed in the hands of the engravers as soon as the patents are issued, and the whole work be prepared for the printer immediately after the close of the year. The number of copies to be printed might be determined by order of either House of Congress after the report is submitted in the same manner as now. If this course be adopted the public will be placed in possession of the information nearly, if not quite, a year earlier than they can under the present system, and the charge upon the Treasury will be in no measure increased.

Concurrent with the establishment of this Office was the adoption of the policy of disposing of the models illustrative of inventions in such a manner as should be conducive to a beneficial and favorable display thereof, the rooms in which they were arranged to be kept open during suitable hours for public inspection. The act also contemplated the exhibition of specimens of unpatented manufactures and works of art. The thirty years which have succeeded have seen the germ thus planted expand into magnificent proportions, until the saloons on the upper floor of the Patent Office are now among the chief public attractions of the seat of Government, and thronged daily by visitors from all parts of the country as well as from beyond the ocean.

Here may be seen at a single glance, as it were, the progressive steps in the invention and perfecting of the wonderful labor-saving machines of the past quarter of a century, from the first blind gropings of mechanical genius, up to the splendid and successful productions of the present day.

The models are not only of great assistance in the examination of applications, but it is my conviction, which I am happy to know is shared by many of those most conversant with the subject, that from ideas gathered in a visit to these halls have sprung many inventions of great value to the community. It is in view of this last suggestion that the wisdom of the framers of the act stands out in the boldest relief since the benefits which are to flow in the future from this source are almost incalculable. If this policy is to be continued, which I hardly allow myself to doubt, the attention of Congress must be turned, at an early day, to the consideration of the manner in which enlarged accommodations for this Office can be provided. Of three hundred and ten cases for the reception of models but twelve are now unoccupied, while one is barely sufficient for a single week's issue of patents. By removing the rejected models which now fill eighty-six cases, and by crowding the whole to their utmost capacity, it will probably be possible to exhibit the patented models of the next three or four years, although with much inconvenience. At the same time, it should be stated, the models accompanying rejected applications are often of a high value for purposes of illustration and suggestion.

The rooms in which the business of the Patent Office is now transacted are even more inadequate for the purpose than are the galleries above. Under the administration of my immediate predecessor it became necessary to use for other purposes some of the rooms before occupied by copying clerks, and the work of copying was given out to be done by copyists at their private residences. Although the practice involves the sending of the files and records of the Office through the streets and into various parts of the city, I have thus far found myself unable to make any change, from the utter impossibility of providing desk room within the building for the fifty-six copyists now employed, and the work of this division is constantly increasing. The large increase in the number of patents requires a corresponding increase in the force employed in engraving and recording, and the orders upon the Office for copies of records and for recording assignments have more than doubled in the last four years.

In 1862 the receipts into the patent fund for copies and recording assignments were \$11,081 50; in 1863, \$16,976 29; in 1864, \$20,055 22; in 1865, \$27,219 64.

A considerable loss of time inevitably results from the interruptions attendant upon placing two examiners with their respective assistants, in the same room, as it is not infrequently the case that inventors or their counsel desire to appear in person and deliver oral arguments before the examiner. In many interference cases there are three or more contesting applicants, and while a cause of this character is being tried on one side of a small room, it is manifest that no business can be transacted upon the other side which requires any close attention or consecutive thought. Notwithstanding this objection, six of the examiners are obliged to accommodate themselves to such arrangement, as there are but thirteen rooms which can be assigned to this branch of the business of the Office. It is worthy of note that the classes in which the work has fallen most behind are in this situation. If additional examiners shall be appointed, as I have recommended above, the evil will but be intensified, unless rooms can be assigned to them which are not occupied by other bureaus. The library is also crowded into a space too narrow to allow the proper arrangement of the shelves, and it is impossible to devote any convenient space for the use of those not connected with the Office who desire to consult the books. In fine, while the occupation of some rooms, in addition to those now at my disposal, is a matter of immediate and pressing necessity, it is evident that many years cannot pass by before the whole of the present building will be needed unless some radical change shall be made in the organization and business of the Office.

The most feasible plan for attaining the relief which is now so urgent, is undoubtedly that of providing rooms in some other building for the use of the Agricultural Department. Of the value of the services which that department has rendered to the country since its organization I cannot speak in too high terms; and with the immense territory which is just opening for the first time for the application of intelligent farming, the labors of the department will be proportionately increased as the bounteous stream of knowledge which it diffuses spreads over a wider and wider field.

If a change of location could in any way impair its usefulness, its removal would be a serious matter; but I am informed that in the opinion of the head of that department, such would not be the result. Already a portion of the clerks are placed in other rooms, and only by an entire abandonment of the Patent Office can the whole department be brought together. If it came properly within the scope of this report, I might consider the propriety of erecting a suitable building for the use of the Agricultural Department; but leaving that subject to the Commissioner of Agriculture, with whom it appropriately belongs, I must reiterate that the absolute necessity of this Office demands additional rooms, which can be obtained immediately in no other way than by the removal of that department.

The law in relation to the issue of patents, as well as the practice of the Office in its general features has been so nearly uniform for a long term of years that any violent innovation is objectionable, but there are some few matters of detail in which, in my judgment, the interests of both inventors and the public would be promoted by a change.

The twelfth section of the act of March 2, 1861, provides that all applications for patents shall be completed for examination within two years from the filing of the petition and in default thereof shall be regarded as abandoned. Under the construction given to this statute by my predecessor, it has been the practice of the Office to regard applications as abandoned when

they have lain two years after a rejection without any action on the part of the inventor to procure a reconsideration. The correctness of this interpretation of the law has recently been questioned, and it must be admitted that a strict adherence to the letter would hardly sustain the rule. There is clearly no reason why an application should be regarded as abandoned in the one case which will not weigh with even stronger force in the other. If the practice spoken of be not adhered to, it becomes impossible to determine when a rejected application can be referred to on the examination of a subsequent one, or when the model and drawing may be submitted to public inspection, as neither is proper while the application is considered as pending. There can be no hardship in requiring one who makes claim to an invention, and who has had one or more examinations by the Office, and then allows the case to rest for two years or more without action of any kind, to present a reasonable excuse for his delay, if he desires to call the matter up anew. I would therefore recommend such an enactment as will leave no doubt of the legality of the course hitherto pursued.

When applications are made for the extension of patents, as the law now stands, the Commissioner alone decides the case, and from his decision there is no appeal. In my opinion this lodges with him too much power.

In the class of cases referred to there is often a very heavy interest at stake, frequently amounting to hundreds of thousands of dollars, and the adverse parties are, the patentee or his heirs on the one side, and the public on the other. The act of 1836 vested this power in a board, consisting of the Secretary of State, the Commissioner of Patents, and the Solicitor of the Treasury; but with the increase of business and the consequent frequency of applications of this character, it became difficult if not impracticable to assemble the board, so that in 1848 a change was made, and the law was fixed as now. Since the establishment of the Board of Examiners in Chief, the evil which led to the passage of the act of 1848 no longer exists, and it appears to me eminently proper that extension cases should be referred to this Board for decision. And the public interest would be rendered more certainly secure if the concurrence of the Board be required before a patent can be extended. The plan suggested possesses the advantage that the matters involved would be considered by four minds instead of one, and there would be much less danger of an extension being procured by corrupt means than where one alone decides the case, and that, too, without appeal. I suppose it to be prudent to so legislate as to guard as far as possible against fraud and corruption, by making it dangerous to attempt and difficult to accomplish, rather than to seem to invite it by making it either easy or safe; and as courts for deciding important causes are seldom so constituted as to consist of but one member, why should the custom be departed from in this instance, where heavy interests are depending?

The sixth section of the act of March 3, 1839, provided that in all cases where an invention had been patented in a foreign country prior to the issue of a patent here, such patent should be limited to the term of fourteen years from the date of publication of such foreign Letters Patent.

On the 2nd of March, 1861, it was enacted that all patents thereafter granted should remain in force for the term of seventeen years from the date of issue. This was construed by my predecessor as merely extending the term, but as in no wise affecting the limitation above quoted from the act of 1839. The Office, therefore, continued to antedate all such patents in the same manner as before the passage of the act of 1861; and as my attention was not called to the point, on my assuming the direction of the office, the same practice has been followed until quite a recent period. My attention having within a short time been called to the subject, it has been held, after consultation with the Secretary of the Interior, that the rule of the Office for the past five years was clearly without any authority of law, the act of 1861 plainly operating the repeal of so much of the act of 1839 as shortens the term of the patent. Although the language of the statute is so explicit as to necessitate this construction, I have reason to believe that such was not the intention of the framers of the act, but that they merely intended to extend the term from fourteen to seventeen years, as an equivalent for the withdrawal of the privilege of extension. The belief that such was the intention of the act was so general among inventors and patent lawyers, that the former ruling of the office was almost universally accepted for nearly five years.

Under this state of facts it is manifestly proper that those patents which were issued for a shortened term, under the former practice of the Office, should be continued in force for the full term of seventeen years from the date of their issue, if the law in relation to the subject is to stand as at present. As, however, some legislation is necessary, I would invite attention to the following considerations.

While an application for a patent is pending, the specification, model, and drawing are held strictly confidential, no knowledge of them being allowed to go beyond the Office without the express consent of the inventor or his duly authorized attorney. Any other course would be full of peril to the honest inventor, as unscrupulous men could readily adopt whatever was valuable in the invention, and there would be no redress. Secrecy is the only protection available before the issue of the patent. But in cases of an invention which has been patented abroad, the full description is already open to the public, so that nothing is gained by treating the application as confidential, while there are reasons of great force for applying exactly the contrary rule to these cases. If any manufacturer or artisan meets with the published description of an invention which, upon inquiry, he learns has not been patented in this country, it is surely legitimate for him to adopt it; and this fact is recognized by the existing statute in denying a patent for an invention patented abroad, if the same has been introduced into use in this country. But this provision has been hitherto almost a nullity in practice, since it is rarely possible for the Office to obtain trustworthy information as to the question of fact. No one but the applicant or

others in his interest is cognizant of the pendency of the application, nor would the knowledge be likely to reach the persons most interested if the veil of secrecy were withdrawn. When the application is made for the extension of the term of a patent, the law requires that notice of the fact shall be given to the public by advertisement in a newspaper in the city of Washington, and in another published in that part of the country most interested adversely to the grant of the petition. I can see no reason why the same rule should not be followed in the case of inventions already patented abroad, and I would therefore recommend an enactment to that effect. As the cost of advertising is about twenty-five dollars for each case, it would be necessary to increase the fee payable on such applications by that amount, but the inventor would be fully compensated for this by the full term for which his patent would run. The much greater probability of the fact of the inventions having been introduced into use being made known to the Office, would deter inventors from the risk of the delay which now so frequently intervenes between the issue of the foreign patent and the applications here. In fact, I am strongly inclined to the opinion that such a change in the law would result in the much earlier introduction of foreign inventions to the American public than has heretofore prevailed.

THOMAS C. THEAKER,
Commissioner of Patents.

The French Iron-clads a Failure.

The fatal truth connected with the *raisons d'Etat* blindes, about which so much fustian has been talked and written, is at last made clear. These vessels are of no use whatever. These iron-plated vessels having made a hole in the budget through which have passed one hundred million of the public money, are declared only fit to remain stationary in port, and will never be able to use their artillery at sea, the slightest motion of the sea paralyzing the action of the guns. This unexpected check to the dream of maritime power indulged in by the Emperor has given a terrible blow to his *amour propre*; and Chasseloup Laubat has been made to bear the brunt of the wrath which should have been lavished on M. Dupuy de Lome, the engineer who constructed the vessels. The mania for creating a monster navy and possessing those three great elements of power—ships, colonies, and commerce—which, according to the great Napoleon, must be regarded as the very souls of national greatness in modern times, is increasing with the present Emperor's old age. He forgets, however, that ships may be built—but neither will colonies flourish nor commerce prosper without liberty—and goes on persecuting the press with more bitterness than ever.—*Liverpool Journal*.

Utilization of Blast-Furnace Gases.

An improvement in the utilization of the waste gases of blast-furnaces has been patented by Mr. J. Cliff, of Wortley, near Leeds; but the patent has become void from neglect to file a complete specification. It has heretofore been common to use the gases generated in the blast-furnaces for heating the hot-air stoves, and for generating steam in boilers, and for some other purposes. Instead of this, Mr. Joseph Cliff proposes to blow them back into the blast-furnace itself. One mode in which this may be done is using an exhaust cylinder, which is connected by pipes with the waste gas-pipe, and is provided with a piston, which is worked by the blast-engine, and thereby exhausts or draws the gases from the waste gas-pipe or furnace, and then forces the said gases into a receiver at such pressure as may be desirable. The gases pass from such receiver to the furnace either by an entirely separate pipe of suitable diameter, which shall deliver the gases close to the tweers, or shall join the air in the tweers immediately before it goes into the furnace, so that there may be a rapid and complete mixture of the air and gases at the point of ignition in the furnace. By these means such portion of the waste gases as may be found most suitable will be made available for the more economical working of the blast-furnace, coals or coke will be saved, a greater heat maintained in the furnace, and the yield or make of iron will be increased.

THERE are ten anchors weighing 8,000 pounds each, and one and a half miles of chains, costing over \$30,000, attached to the *Dictator* and *New Ironsides*, now anchored at League Island, to preserve them from the tremendous power of the ice.

MR. W. R. BROOKS, whose Lamp Trimmer was illustrated in No. 8 of the SCIENTIFIC AMERICAN, desires correspondents to address him in future at Syracuse, N. Y., Box 196.

Improved Broom Head.

Brooms are quite an expensive item in housekeeping, and many of them are worn out in the course of a year. Recently several patents on broom heads, or shanks, in which the corn is held, have been taken out by inventors, and we hear of their general success. The idea is to furnish a holder that can be readily filled by any person, so that those who live in the country, or the suburbs of cities, can plant a few hills of broom corn and raise their own brooms, thus obtaining them at a tithe of the cost if purchased at stores.

The engraving here published illustrates one of these new broom heads, and the description appended will give a clear idea of the manner in which the operation is performed.

The material for the broom consists of single stalks, so to speak, having a long stem; one of the stalks is shown at A. These are placed together in a bundle and arranged as shown at B, the stems being passed through the metallic loop, C, and piled alternately one over the other, until the loop is full. The position of the material at this stage is shown at D. This loop, filled with the corn, is then inserted in the shank, E, of the broom handle, the holder, F, having been previously slipped over the top of the bundle so as to keep it together. The whole is then screwed into a nut inside the handle, and thus firmly held in a compact form. This method of constructing a broom makes a much better article than the old-fashioned one, for the shank is stiff and held fast, thus obtaining a spring or elasticity which is valued by housekeepers. The holder is made of tin, sheet brass, or German silver, and will last for years when properly used, and the broom can easily be refilled at any time when worn out.

A patent was obtained on this invention Dec. 19, 1865. For further information address Silvers, Patent Broom Company, No. 28 West Fourth street, Cincinnati, Ohio.

**SILVERS'S BROOM HEAD.****Water Freezing at a Depth of Twenty-five feet.**

The Detroit Water Commissioners have for many years encountered a difficulty in obtaining water from the river in the winter.

The inlet pipe to the pump well is made of boiler iron; it is thirty inches diameter, its extreme length is about 220 feet, and it extends into the river 150 feet from the wharf, into water 34 feet deep at the extreme end. On the river end of the pipe there is a bell-shaped mouth, elbow turned upward, the end of which is 36 inches diameter, over and surrounding which there is a strainer also made of boiler iron, 9 feet diameter and 10 feet high; above the end of the pipe the boiler plate in the strainer is punched with half-inch holes—144 to each square foot.

Under certain circumstances, during extreme cold weather, it is with difficulty a supply of water can be obtained, in consequence of the accumulation of ice on the strainer.

When the river is covered with ice over the strainer the ice does not collect at any degree of cold. The greatest difficulty occurs when the thermometer ranges from 7 to 8 deg. to 18 or 20 deg. above zero, greater than when it is below zero, and when the mercury rises above 20 deg., however sudden, the ice disappears. The greatest collection, it has been observed, occurs at night, and when the sun is obscured by clouds, but when the sun is unclouded no difficulty is ever experienced.

Dr. Pitcher addressed a letter to Professor Douglass, of the State University, inclosing one from Mr. R. E. Roberts, Secretary of the Water Commissioners, detailing the facts given above, and asking an explanation

of this phenomenon. The following is the reply of Professor D. M. Liss:—

UNIVERSITY OF MICHIGAN, Jan. 29, 1866.
ZINA PITCHER, M. D., Detroit. Dear Sir: Your letter, conveying a communication from R. E. Roberts, Esq., in relation to the obstruction of the supply pipe at the water works in your city, was duly received, and I have given the subject careful consideration. With the facts which the letter affords, I am unable to give an explanation of the singular phenomena entirely satisfactory to myself. Mr. Roberts states that the ice does not form on the strainer when the sun shines, but does not give the effect of a cloudless night, probably no observations have been made. I think, however, on careful investigation that this will be found to be the most favorable condition for the depo-

sition of ice. Should this prove true, I should explain the phenomena upon the principle of Wells's well-known and acknowledged theory of the formation of dew, viz., by radiation.

The extremity of the pipe is a good radiator of caloric as well as a good absorber. When the water reaches about the temperature of 32 deg., the pipe parting with its caloric by radiation into space, is so far reduced in temperature as to cause the water to congeal upon its surface. The clear water being to a great extent translucent, would not interrupt the passage of the caloric. Nor would the great depth affect it, for it is well known that caloric that has been transmitted through one layer of translucent medium will be transmitted through any number of layers. The rays of the sun would also convey heat through the water to the pipe (a good absorber of caloric), and thus dissipate the ice. As soon as the ice forms upon the river, all radiation and transmission of caloric would be stopped by the intertransparency of the ice. Upon this theory, we should have ice most freely on the strainer in clear and cloudless nights before ice has covered the river. It would also be dissipated in a cloudless day. The last seems to be true if not the first.

Assuming this as the true theory, I would suggest the following remedy of this evil:—Procure three or four large scows or timber raft, and have them anchored directly over the pipe. They will intercept the heat radiated from the pipe, and send it back to the source from whence it came. If the evil is a serious one, the experiment is worthy of a trial. I think the scows will prevent the ice forming on the strainer.

Very respectfully,
SILAS H. DOUGLASS.

The number of pumping engines reported in England for the month of December is 31. These consumed 2,769 tons of coal, and lifted 209 tons of water ten fathoms high. Average duty 50,900,000 lbs., lifted one foot high by the consumption of 112 lbs. of coal.

WATER-WEED FOR FODDER.—At a recent meeting of the Chemical Society in London, Dr. Smees stated that the American water-weed is about as rich in nitrogen as clover, and may be used as cattle food.

Colors from Coal Tar.

Aniline, or coal tar colors, have now been extended in number, so that all the colors of the rainbow, and all the shades, can be obtained from coal tar. Aniline was discovered by Unverdorben in 1826, who procured it by the destructive distillation of indigo. It is now obtained in small quantities directly from the destructive distillation of coal, as in gas-works, but is generally manufactured from the lighter coal tar naphtha. When the naphtha is rectified, the portion which distills over at a temperature of 180° Fab. is benzole, and this substance was discovered by Faraday in 1825. By the action of strong nitric acid, the benzole is converted into nitrobenzole, and this latter, when agitated with water, acetic acid, and iron filings, becomes aniline. By the action of oxidizing agents, such as chloride of lime, bichromate of potash, chloride of mercury, etc., the aniline, which is colorless by itself, can be transformed into all shades of violet, mauve, magenta, etc. By the researches of Hofmann, the number and beauty of the aniline colors have been increased. While numberless shades of reds and purples can be obtained, there is a splendid green, called verdine, discovered by Eusebe, and which remains a true, pure green even by candle or gaslight; a blue which is as clear as opal, a good yellow, and a fair black. In short, dyes of all hues can be obtained from aniline, which, in its turn, is procured from the coal tar. The intensity of these aniline colors may be indicated by the fact that one grain of magenta in a million of water gives a good red; one grain in ten millions of water exhibits a rose pink; one grain in twenty millions communicates a blush to the water; and one grain in fifty millions tinges the water with a reddish glow. The powerful tinctorial virtues of these dyes may be learned from a circumstance which occurred during the passage of the *Great Eastern* between Liverpool and New York, when the sea was observed to exhibit a crimson

hue for some distance around the vessel, and when it was afterwards discovered that the bloody sea owed its color to a wave having stove in a plate of the *Great Eastern*, and thus the water got access to certain vessels which contained magenta.—*Mining Journal*.

Large Wire Manufactory.

At the Quinsigamond Iron Works of Messrs. Washburn & Moen, Worcester, Mass., iron wire is made on a most extensive scale. Upward of eight tons per day of iron wire of all sizes is manufactured, besides hoop-skirt wire to the amount of six tons. They are the largest makers of iron and steel wire in the country.

Wire for hoop skirts is drawn out round, then flattened by passing it through rollers, and, lastly, tempered by running it through a bath of melted lead and another of oil. It is subsequently covered with cotton yarn and is ready for market. The covering is also done at these works.

The sizes of wire manufactured run from half an inch to forty-six gage. A curious item in the manufacture is the quantity of flour used. This would seem to be one of the last materials needed in an iron mill, but many hundred barrels are worked up in the course of a year. It is made into a paste and rubbed on the wires to "lubricate" them as they pass through the draw plate and prevent cutting.

A fine new mill is being built by the Company on the premises immediately adjoining their present works. This structure is five stories, built of brick, and is 146 feet long by 50 feet wide, and has in the aggregate an acre of flooring.

The quality of goods turned out from these works is unsurpassed, and they are used for all purposes, from bridge building to pianoforte making.