

of snow required to yield an inch of water from observations taken here :—

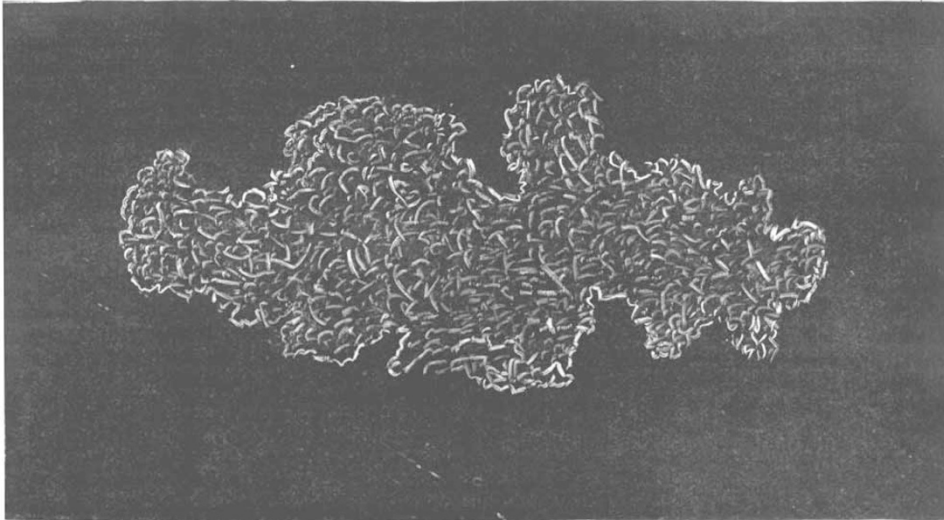
1886, January 23, snow 2 inches, melted '063 (*i.e.* 33 inches for 1 inch of water); March 1, snow 7 inches, melted '800 (*i.e.* 9 inches for 1 inch of water); December 26, snow 7 inches, melted '967 (*i.e.* 7 inches for 1 inch of water). 1887, January 4, snow 3½ inches, melted '379 (*i.e.* 8½ inches for 1 inch of water); January 7, ½ inch, melted '030 (*i.e.* 6 inches for 1 inch of water).

The damage done on December 26 was unusually great, the snow being very heavy, as much as 5 lbs. weight on a square foot of a cedar-branch; this, when moved by the wind, caused much breakage.

January 8.—Since sending my note yesterday I find that at Chepstow and at Itton the snowflakes were larger than anyone

had before seen, so that probably the storm had an extended area; at all events it was 5 miles broad.

The present storm is a very similar one to that recorded by myself in January 1838, except that the largest flakes in 1838 did not exceed 2 inches. In that storm the largest flakes fell more rapidly and more perpendicularly. I then pointed out that large snowflakes were produced by two upper currents driving the flakes together; and afterwards, by the largest falling with increased velocity and more perpendicularly: they were thus able still more to augment their dimensions by adding smaller ones to their bulk. This was well seen on January 7, when an estimate was made as to the velocity and angle of their descent. Not only were a number seen to be added as they fell upon them, but it was thought that small flakes when near to the



Shape and size of snowflake. (There were more of a somewhat similar form to this than the more circular ones, though there were very many more circular and less indented.)

large ones were attracted to them. The flakes were, however, large whilst at a considerable distance from the ground.

Several flakes were sketched before they began to melt, and one of the sketches is sent as an illustration. The glasses were at a temperature of freezing, and therefore it was some time before the snow melted, and not thoroughly so until they had been 5 minutes in a hot-house.

January 13.—The snowflakes folded over on the edges, boat-like, and this curling over caused the thick look observed. There was a slight zigzag in their downward course of some 2° or 3°. This storm passed over Chepstow, Itton, and Monmouth in this county; Wirewoods Green, Tidenham, and Dennil Hill, all in Gloucestershire, and Bath: in all of these places the flakes are spoken of as the largest ever seen. One correspondent at Chepstow reports them as larger than the hailstones in the storm of May 1848, which were larger than hens' eggs, and broke the shop windows, and destroyed the glass of hot-houses near Chepstow.

E. J. LOWE

Shirenewton Hall, near Chepstow

Auroras

THE account, in NATURE for December 16 (p. 159), of a bright cloud "emitting brilliant rays of light," that suddenly appeared at Hamar, in Norway, on the night of November 3, recalls the fact that on November 2 there was at Lyons, New York, an aurora which at one time during the evening consisted entirely of detached luminous clouds, as was noted in NATURE for November 18 (p. 54). It is stated that on November 4 one of the finest auroras of the year was visible at Throndhjem, Norway.

M. A. VEEDER

Lyons, N. Y., January 3

A Solar Halo

IN the weather report issued on Friday evening, the 14th inst., a solar halo is recorded as "observed in Jersey during the day."

Between noon and 12.30 I observed a very complete and well-defined halo, of radius about $\pi/8$, in this neighbourhood. It was not perceptibly tinted, but the duskiess of the interior, as compared with the clear sky exterior to the luminous ring, was more pronounced than I ever remember to have noticed it on other occasions—so much as to suggest comparison with the "curtain" of the aurora: "Solem quis dicere falsum audeat!"

J. J. WALKER

Hampstead, N. W., January 15

THE NATIONAL SCIENCE COLLECTIONS¹

II.

25. REVERTING to this country, the "Patent Museum," now under the charge of the Science and Art Department, is a collection of a peculiar nature; and in order to explain its origin, and the objects it was intended to serve, we may make some extracts from the Report of a Select Committee of the House of Commons, appointed in 1864, to inquire as to the most suitable arrangements to be made respecting the Patent Office, Library, and Museum. The Committee said:—

The second point to which your Committee directed their attention was that of the Patent Museum, having regard especially to its formation, its present state, its relation to the Patent Office and Library, and the nature of its contents, so as to render it practically useful.

Your Committee found that the Patent Museum was formed by Mr. Woodcroft, the Superintendent of Specifications, by the request of the Commissioners of Patents, and that it consists of models and machines belonging partly to the Commissioners of Patents, partly to the Commissioners of the Exhibition of 1851, and partly to Mr. Woodcroft himself, and various private persons.

¹ Continued from p. 254.

This collection has been exhibited since 1857 in the iron building at South Kensington.

Your Committee are of opinion that the term Patent Museum (which is generally applied to this collection) tends to give an erroneous impression as to its character and object.

Various suggestions have been made by witnesses respecting the nature of a Museum connected with the mechanical arts, which may be summed up as follows:—

(a) That it should illustrate the history of those arts by a collection of original machines from an early period to the present time.

(b) That it should exhibit all known inventions respecting machinery and manufactures.

(c) That it should show the present state of all machinery and manufactures.

(d) Some of the witnesses suggested that the collection should be restricted to the machinery and manufactures of the United Kingdom; whilst others proposed that it should be extended to those of foreign countries.

(e) Some, again, proposed that the collection should contain all the objects of each class, whilst others proposed that a selection only of the most important objects should be exhibited.

(f) There was no less diversity of opinion respecting the primary purpose for which any collection or exhibition should be made; some of the witnesses considered that it should be for the purpose of conveying instruction in the mechanical arts, either in a cursory way to people who might visit the Museum, or to students in mechanics, or to persons desirous of applying themselves to the discovery of improvements in machinery and manufactures.

(g) Other witnesses deemed the Museum chiefly desirable for the information of persons intending to take out or purchase patents, in aid of the information afforded by books and specifications, to assist them in ascertaining whether the contemplated patent would be valid as a new invention.

(h) On the other hand, two witnesses, Mr. Carpmael and Mr. Johnson, gave it as their opinion that for all purposes of the patent law a museum of models would be practically valueless.

Your Committee are of opinion that any special collection of patented inventions made for the purpose of evidence, illustration, or record of patent rights is not so connected with a general museum of mechanical inventions as to render the neighbourhood of such a museum to a patent office and library, or law courts, necessary.

It appears to your Committee that the chief purpose of a general museum is to illustrate and explain the commencement, progress, and present position of the most important branches of mechanical invention; to show the chief steps by which the most remarkable machines have reached their present degree of excellence; to convey interesting and useful information, and to stimulate invention.

In forming an illustrative collection of inventions it would be necessary to adopt the principle of selection. This, however, does not appear to your Committee to be an insuperable objection, especially as no one proposed to substitute models for specifications, which for all the purposes of administering the patent law would still have to be consulted, and bear the stamp of authority.

Such a collection should contain a selection of models of moderate size, which should illustrate different departments of inventions, and also a selection of models of current patented inventions.

The Patent Collection, although it was placed in premises belonging to the South Kensington Museum, remained in the hands of the Commissioners of Patents until January 1, 1884, when, by the "Patents, Designs, and Trade Marks Act, 1883," 46 and 47 Vict. c. 57, it was transferred to the Science and Art Department.

The title "Patent Museum" was never accurate; the collection might with greater propriety have been called the "Woodcroft Museum," from the name of the gentleman, formerly Clerk to the Commissioners of Patents, who originated the formation of it. It contains objects illustrating steps in the history of mechanical inventions, and contrivances of importance and interest, without regard to whether they have been patented or not. Among these, for example, are the earliest locomotive and stationary steam-engines; the first engine used in steam navigation; the first reaping-machine; Arkwright's original spinning-machinery; all Sir Charles Wheatstone's original apparatus, showing a complete history of the various steps by which he perfected electric telegraphy; many of Edison's original electrical inventions; some old clocks dating from 1325; and other objects of similar interest.

Inventions embodied in future patents may be added to this Museum, pursuant to Sections 41 and 42 of the Patent Act above mentioned. These sections enact as follows:—

(41) The control and management of the existing Patent Museum and its contents shall, from and after the commencement of this Act, be transferred to, and vested in, the Department of Science and Art, subject to such directions as Her Majesty in Council may see fit to give.

(42) The Department of Science and Art may at any time require a patentee to furnish them with a model of his invention, on payment to the patentee of the cost of the manufacture of the model; the amount to be settled in case of dispute by the Board of Trade.

We do not consider it to be feasible to combine a complete museum of patented inventions with a methodical collection of objects illustrating practical science, and we infer from the language of Parliament in the provisions just quoted that this is the view taken in the recent Patent Act, which enables, but does not oblige, the Department of Science and Art to acquire specimens of patented inventions.

26. We conceive that it will be useful for the curators of all the collections to bear in mind that their primary and indispensable scope is to provide apparatus and specimens for the instruction given in the Normal College of Science, and for the teaching of science generally throughout the United Kingdom.

Cases may doubtless arise where the acquisition or reception of other objects may be expedient, in the interest of science or of the arts; but in these cases, in order to prevent the unnecessary occupation of space, we recommend that due regard be had to existing public collections elsewhere, so as not unnecessarily to duplicate the provision for illustrating science.

27. Referring now to the space required, we adopt the following figures given by the Reports of the different Committees, adding some estimates for the future where they have not been stated:—

	Space now required	Estimated increase of space required in ten years	Space required at the end of ten years
	Sq. ft.	Sq. ft.	Sq. ft.
Various science collections	37,000	3,000	40,000
Naval models	10,500	10,000	20,500
Building construction	15,000	10,000	25,000
Fish culture	5,000	1,000	6,000
Educational collection and library	7,500	1,000	8,500
Mechanical collections... ..	45,000	15,000	60,000
	120,000	40,000	160,000

In framing their estimates, the Committees generally took, as the basis of their computation, top-lighted galleries 30 feet wide, which afford a large amount of well-

lighted wall-space in proportion to floor-area. But with galleries side-lighted, in which some part of the collections must necessarily be housed, an increase of floor-area will be required.

28. In adopting these estimates, we think an indefinite series of demands for accommodation, involving an indefinite extension of space, ought not to be contemplated. The pleas commonly put forward for such extension at the close of every Exhibition are the number of articles which are either offered as gifts or are said to merit acquisition. We think that merit alone should be the ground of admission, and that even this ground must be subject, in the first place, to the consideration of space, and next, to that of scientific arrangement. If space is to be in any degree limited, and scientific arrangement to be maintained, it is evident that exclusion and depletion, as well as completion, must be kept in view; and that while the Department of Science and Art is left all possible freedom in determining what the contents of its collections shall be, it should be strictly confined to the area which is represented to be sufficient for the future.

In the due appropriation of this area we do not consider that, as a rule, and except in cases of historic interest, engines and machines of the original size should be acquired, or even accepted on terms implying that they will continue to be exhibited otherwise than in models.

29. Comparing now the estimates of space required with the area at present available, we find as follows:—

The total available floor-space in the present buildings, assuming the Western Gallery, D, to be given up, and the building E to be abolished, is 51,500 square feet.

This is 17,480 feet less than the collections at present occupy, and less than half what the Committees estimate for them when fairly completed.

It is clear, therefore, that new buildings are absolutely required.

PROVISIONS FOR HOUSING THE COLLECTIONS

30. The second duty confided to us is:—

To suggest plans for housing the collections in the existing galleries to the south of the Horticultural Gardens, or in new galleries to be built upon their site, and the adjacent ground now the property of the Government.

31. In considering this matter, we have had the valuable assistance of Mr. Taylor, the Surveyor to Her Majesty's Office of Works, who has, in accordance with our suggestions, carefully examined the existing buildings, and prepared sketch-plans and estimates to meet the circumstances of the case.

32. We have already referred to the land available. It is shown on the Drawing No. I., marked G, and coloured red, and it consists of a plot of ground to the south of the South Galleries A, B, C, containing 4 acres and 23 square yards.

This land, as well as the site and ground of the Natural History Museum to the south of it, was purchased by the Government, in 1864, from the Commissioners of the Exhibition of 1851, and the particulars of the transaction are fully set forth in the Fifth Report of the Commissioners, dated August 15, 1867.

33. In this Report (p. 31) the Commissioners say:—

"We have set forth in detail all the circumstances connected with the sale by us to Her Majesty's Government of the site of the Exhibition of 1862, with the sanction of Parliament, and under the special condition that the site in question shall be permanently devoted to purposes connected with Science or the Arts."

This condition is fully and strongly carried into effect in the deed of conveyance, which is published as an Appendix to the same Report; so that the appropriation of this land for the erection of a Science Museum is in strict compliance with the conditions of its acquisition.

34. The buildings forming the southern range A', A, C, B, B', although not of first-rate character, will yet last in good order for many years to come, as will also the Western Gallery D.

We are, however, of opinion that a plan should be prepared to include the eventual reconstruction of the whole southern range.

But it should be a plan capable of being carried out by degrees, as and when necessity demands.

35. Drawing No. II. shows a ground plan of a design which fulfils these conditions.

It provides for two three-storied buildings of ornamental elevation, forming frontages (with returns) to Exhibition Road on the east, and to Queen's Gate on the west; and for plain two-storied buildings adjacent to these east and west frontages. These buildings, together with the existing southern buildings (A, B, C) will afford the required space until the latter become unserviceable, and permanent structures have to be erected on their site.

These buildings would give room for the collections, with the necessary offices, for the Portrait Gallery, and, if desirable, for examination-rooms.

MEASURES RECOMMENDED

36. The measures we recommend are as follows:—

SECTION I.—*Alteration of Arrangements in the existing Galleries*

(a) Remove the collection from the upper floor of the Western Gallery, D, and place it temporarily on the lower floor of the same building, and in A, B, or C.

(b) Remove the Portrait Gallery into the upper floor of the Western Gallery, D; this floor has been used during former Exhibitions as a Picture Gallery, and has given great satisfaction to the artists. This gallery, as it exists, is more secure against accidents by fire than the building in which the pictures are now placed, and can be rendered, at a moderate outlay, practically incombustible.

(c) Clear out the ground floor of the Western Gallery, D. (d) Then use this ground floor for examination-rooms. When this is done, the entire Western Gallery, D, will be occupied, and none of it will be further available for the collections.

(e) Make an opening through the wall which now shuts off the centre building, C, so as to give an approach from Exhibition Road to the western parts of the galleries, and thus do away with the unsightly gallery K.

(f) Proceed to arrange the rooms as they are set free.

(g) In addition to the access from Queen's Gate to the portrait gallery in D, afford access to it from Exhibition Road through the Science collections.

SECTION II.—*New Works to be undertaken*

37. The proposed new building is so designed that it may be carried out in separate portions progressively.

The portion to be first undertaken should be on the parts marked L and L', with the temporary entrances, all coloured yellow on the drawing No. II. These buildings may be completed in about eighteen months, and are estimated to cost about 43,520*l.*, which may be distributed over the financial years 1886-87, and 1887-88.

Before the end of 1887, also, the option must be exercised of purchasing the central building, C.

When the above-mentioned first portions of the new building are completed, they will add an available area of 28,700 square feet, which, with the areas already existing in the southern galleries, will make a total of 80,200 square feet.

This will provide, for the Science collections, about 11,000 feet more than they at present occupy, and it will admit of the Patent Museum being removed to the western side of Exhibition Road, and of the building E

being abandoned. At the same time the temporary appropriation of the Western Gallery, D, to the Portrait Gallery and the examination-rooms, will give them an advantageous increase of accommodation. Hence, by this first instalment of the new works, a considerable improvement on the present state of things will be effected; but the space will still be much below what has been estimated as necessary by the Committees who have investigated the matter.

38. The next portion to be undertaken may be the building with façades at the eastern end, marked M¹ on the drawing, and coloured red. This is estimated to cost 54,183*l.*, and it will furnish 33,750 square feet of additional floor-space.

When this is built there will be, in all, 113,750 square feet available, *i.e.* enough not only to accommodate the present collections, with some increase, but also to receive the Portrait Gallery, and to provide examination-rooms, if required.

At this time, therefore, there will no longer be any need to hire from the Commissioners of 1851 the Western Gallery, D, and thus an expenditure of 2000*l.* per annum will be saved.

39. The accommodation can afterwards be extended from time to time, as and when means may be voted for the purpose, by the erection of the other portions shown on Drawing No. II., as follows:—

	Additional space obtained Square feet	Estimated cost <i>£</i>
Interior building at the east end, marked N ¹ , and coloured brown	28,350	32,930
Building with façades at the western end, marked M, and coloured red	37,950	59,240
Interior building at the west end, marked N, and coloured brown	28,350	32,930

40. The entire floor-space gained by the new buildings, when completed according to Drawing No. II., will be 157,100 square feet. To this must be added the space in the existing southern galleries, which will be assumed still to remain available. They contain, at present (as we have already stated), 51,500 square feet; but, in the process of building the new erections, a portion of the old ones will have become absorbed therein, and the space will be reduced to 41,818 square feet. The total available space will therefore amount to 198,918 square feet.

The total estimated cost of the new work shown on Drawing No. II. is 222,803*l.*

41. In submitting this Report to the Treasury, we desire to state to their Lordships that one of the principal considerations guiding us has been to prepare a plan which admitted of being executed in parts, but which, when completed, should suffice for as long a period as we think it necessary to foresee. We have taken as our starting-point the demand of 160,000 square feet of area, and we have shown how it may be provided without more than a strictly temporary use of the Western Gallery, which does not belong to the Government.

42. We have been invited to express an opinion as to whether there would be space, in the completed plans, to provide for the collections now housed in the Museum in Jermyn Street, and the instruction now given there. We believe that there would be space for the purpose.

We have the honour to be, Sir,

Your obedient Servants,

WILLIAM POLE,
Secretary,
Westminster, July 27, 1885

FREDERICK BRAMWELL
LINGEN
J. F. D. DONNELLY

P.S.—Mr. Mitford dissents, for the reasons appearing in a separate Report handed in by him on the 4th ultimo, which, with other documents relative to it, is inclosed in the letter covering our Report.—F. B.; L.; J. F. D. D.

TRANSMISSION OF POWER BY COMPRESSED AIR

A MOST interesting experiment is about to be tried in Birmingham. A Company, whose engineer is Mr. J. Sturgeon, has obtained Parliamentary powers to supply power from a central station by compressed air through pipes laid in the streets. The application to Parliament was supported by the Birmingham Corporation, and the powers extend over an area of between four and five square miles. It is at first intended to restrict operations to about one square mile and a half. This area will include twenty-three miles of main pipes. The central works are designed for the production of 15,000 horse-power, of which the engines laid down at first will supply 6000 horse-power. The authorised capital expenditure for the whole is 276,800*l.*, of which 150,000*l.* will be spent at once for the initial 6000 horse-power. In this journal we have nothing to do with the financial aspects of the project, but we mention these figures to show that within a short time the system may be expected to be in operation on such a scale as will very fairly test its mechanical efficiency. At a recent meeting of the directors it was determined to start clearing the ground and commencing the foundations for the central station at once, so that by next summer we may see considerable advance made towards the realisation of the project.

This is the first time that an experiment of this kind has been tried in Britain. Power is distributed from a central station at Hull by the hydraulic system, but transmission by air has hitherto only been tried in small installations at mines, quarries, in sinking piers, as at the Forth Bridge, and in tunnel-boring. In mines and tunnels it has very evident advantages, in that it keeps up a continual supply of fresh, cold air where ventilation is very much needed; and therefore its undoubted success at the St. Gothard works does not demonstrate its certainty of success for the distribution of power on a large scale to the workshops of a town where the atmosphere is bearably pure. Moreover, the pipe systems of these small installations have not been sufficiently long and complicated to test in any severe sense the liability to loss by friction, leakage, and variation of temperature.

The results of the present experiment will therefore be of the utmost scientific value to engineers, and will be watched with corresponding interest. No fairer field for such an experiment could be found than in Birmingham, which is marked out from all other towns by the enormous number of its small workshops requiring minute amounts of driving-power, and the total turn-over of each of which is too small to enable the owner to afford skilled tendance to his boiler and engine. In these small shops the power is required only intermittently throughout the day. At times the engine may actually stand altogether for an hour or two, while it is only rarely that it is called to exert more than a comparatively small fraction of its full power. Meanwhile the large loss due to furnace and boiler inefficiency—that is, to waste of heat by radiation and by hot gases passing up the chimney—goes on steadily at a pretty uniform rate. Under such circumstances, the advantages of generating the power at a great central station are so evident as not to require demonstration. The question of chief technical interest is really as to whether the best means of distribution is by air, by water, by electricity, or by cheap gas to be used in gas-engines. That question can only be finally settled by expensive experiment. In passing, the writer may indicate his own opinion that there lies in the future a magnificent field for enterprise on the part of the gas companies of large towns in supplying cheap gas for heating and the production of mechanical power, and it is most decidedly their interest to improve the efficiency and lower the prime cost of gas-engines.

The site of the central works is a triangular plot of ground adjoining Garrison Lane, at the intersection of the