SCIENCE

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A NEW DYNAMO AND PROJECTOR.

A PERFECT dynamo must be correctly designed both electrically and mechanically, in which case it is, with ordinary management, certain to operate with satisfaction to the user, good material and workmanship being presupposed. From the fact that dynamos are necessarily designed by electricians, it has been observed heretofore that many types have been unsatisfactory in mechanical performance. The new dynamo of the United States Electric Lighting Company, here illustrated, has had the benefit of many years of development. The patterns for it have recently been entirely remodelled, to take advantage of the best points in the antecedent dynamos of both the Westinghouse and United States Companies, and it is consequently a most practical and efficient generator.

The field-magnets part along a horizontal plane, so that, by removing the yoke and unbolting the two halves, the upper half can be lifted away and the armature removed. This is convenient in cramped situations. The same construction enables it to be carried into restricted locations which would not be accessible to a dynamo built in one piece. The armature itself is wound in a single layer upon a laminated core, practically obviating the liability to heating. Ball bearings are used on both ends of the shaft.

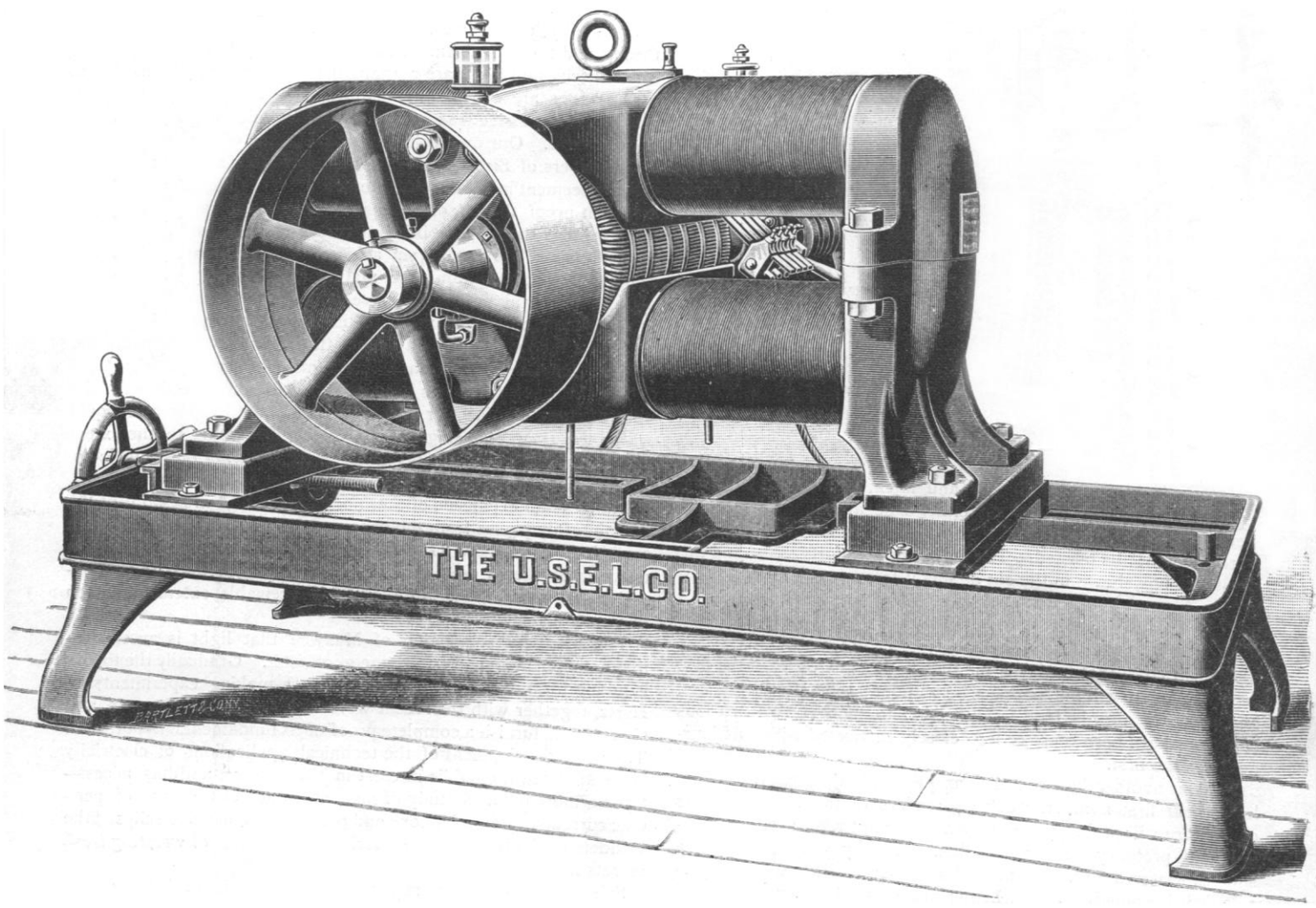

FIG. 1.—NEW DYNAMO WITH ELEVATED BASE.

The lower horn of the casting is hollow, and serves as a reservoir for oil running through the bearings. Oil can therefore be supplied copiously, and drawn off and returned to the cups without waste. The dynamo is carried on an elevated base, making it more accessible to the operator. If desired, the legs may be removed, and the base bolted to a foundation. The base is provided with the usual tension-screw.

The United States electric-light projector is shown in Fig. 2. It has both a horizontal and vertical motion, so that the light can be thrown in any direction. It carries a focusing-lamp in a parabolic reflector. When out of service, the case is rigidly locked in position by clamps at the side and a catch at the base, protecting it against the jarring of a sea-way or otherwise. The glass face is in strips to avoid cracking from unequal expansion. Its hinges

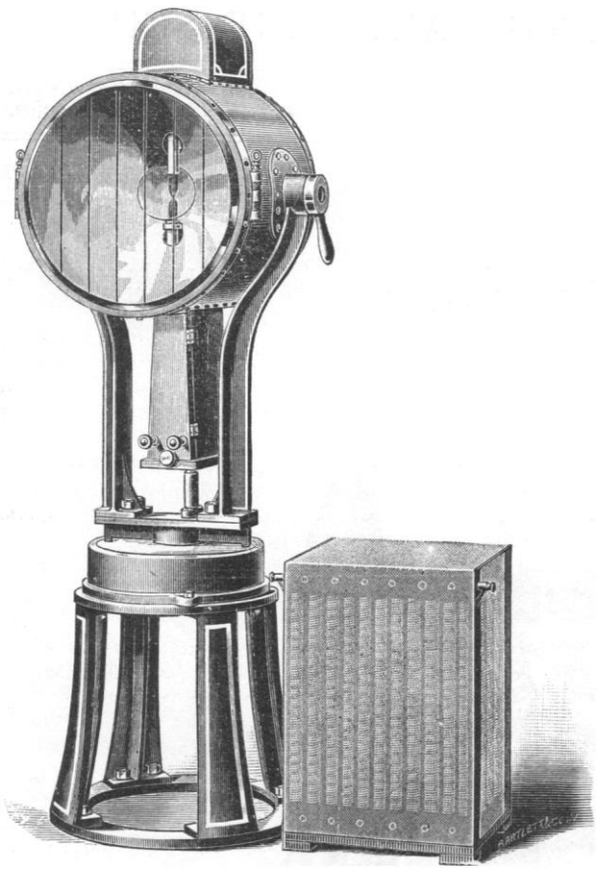

FIG. 2. — ELECTRIC PROJECTOR.

are made to act both as hinges and latch, so that by drawing a pin the face can be opened on either side at will. All adjustments are outside the case, so that the doors leading to the lamp-works need not be opened. The lamp requires forty volts, and the resistance-box shown in the cut adapts it to any circuit.

TWENTY YEARS.[1]

A REMINDER that to-day is the twentieth anniversary of the first issue of *Nature* will not, perhaps, be without interest to our readers, and certainly affords food for reflection to those who in various capacities have been more or less closely connected with this journal from the first.

"When another half-century has passed," said Professor Huxley in our first number, "curious readers of the back numbers of *Nature* will probably look on *our* best 'not without a smile.'"

It will probably be so; but, though twenty years is hardly a sufficient interval to make our smiles at our earlier efforts supercilious, it is enough to test whether progress has been made, and whether the forward path is pursued with growing or with waning force.

As regards this journal itself, we may claim that it has not disappointed the hopes of its founders, nor failed in the task it undertook; and we make this claim all the more emphatically because we feel that what has been accomplished has not been due to our own efforts so much as to the unfailing help we have always received from the leaders in all branches of natural science. This help has not been limited to their contributions to our columns, but has consisted also of advice and suggestions which have been freely asked and as freely given. Not the least part of our duty, and even privilege, to-day, is to state openly how small our own part has been, and to render grateful thanks to those to whom it is chiefly due that *Nature* has a recognized place in the machinery of science, and has secured an audience in all parts of the civilized world.

We do not wish, however, to narrow our retrospect of the last twenty years by confining our attention to the measure of success which these pages have won. It has been attained, as we have shown, by the aid of nearly all the best-known scientific writers and workers, not in Britain only, but in many countries old and new; and we cannot believe that they would thus have banded themselves together, if evidence had not been given of an honest desire for the good of science and for the "promotion of natural knowledge," or if the attainment of these objects had not been regarded by us as of more importance than a journalistic success. Thus, on its twentieth birthday, we would think not so much of the growth of *Nature* as of the advance which in the last twenty years it has chronicled.

A formal history of science for that period would be a formidable task, but it is already possible to discern what will probably appear to posterity to be the most salient characteristics of the last two decades.

In the physical sciences, the enormous development of the atomic theory, and the establishment of a connection between the theories of electricity and light, are perhaps the two main achievements of the years we are considering. Methods of accomplishing the at first sight impossible task of measuring atomic magnitudes have been devised. Our own volumes contain some of the most interesting papers of Sir William Thomson on this subject; and the close agreement in the results attained by very different methods is sufficient proof, that, if only approximations, they are approximations we may trust. The brilliant vortex atom theory of Sir William Thomson has not as yet achieved the position of a proved hypothesis, but has stimulated mathematical inquiry. A number of very powerful researches have added to our knowledge of a most difficult branch of mathematics, which may yet furnish the basis of a theory which shall deduce the nature of matter and the phenomena of radiation from a single group of assumptions.

The theory of gases has been extended in both directions. The able attempt of Van der Waals to bring both vapor and liquid within the grasp of a single theory is complementary to the extension by Crookes, Hittorf, and Osborne Reynolds, of our knowledge of phenomena which are best studied in gases of great tenuity.

The gradual expansion of thermodynamics, and in general of the domain of dynamics from molar to molecular phenomena, has been carried on by Willard Gibbs, J. J. Thomson, and others, until, in many cases, theory seems to have outrun not only our present experimental powers, but almost any conceivable extension which they may hereafter undergo.

The pregnant suggestion of Maxwell that light is an electromagnetic phenomenon has borne good fruit. Gradually the theory is taking form and shape; and the epoch-making experiments of Hertz, together with the recent work of Lodge, J. J. Thomson, and Glazebrook, furnish a complete proof of its fundamental hypotheses. The great development of the technical applications of electricity has stimulated the public interest in this science, and has necessitated a more detailed study of magnetism and of the laws of periodic currents. The telephone and the microphone have eclipsed the wonders of the telegraph, and furnish new means of wresting fresh secrets from nature.

Science has become more than ever cosmopolitan, owing chiefly to the imperative necessity for an early agreement as to the values of various units for a common nomenclature, and for simultaneous observations in widely separated localities. International conferences are the order of the day, and the new units which they have defined are based upon experiments by many first-rate observers in many lands, among whom the name of Lord Rayleigh stands second to none.

On the side of chemistry, the periodic law of Mendeleeff has become established as a generalization of the first importance, and the extraordinary feat of foretelling the physical properties of an as yet

[1] From Nature, Nov. 7, 1889.