SCIENCE

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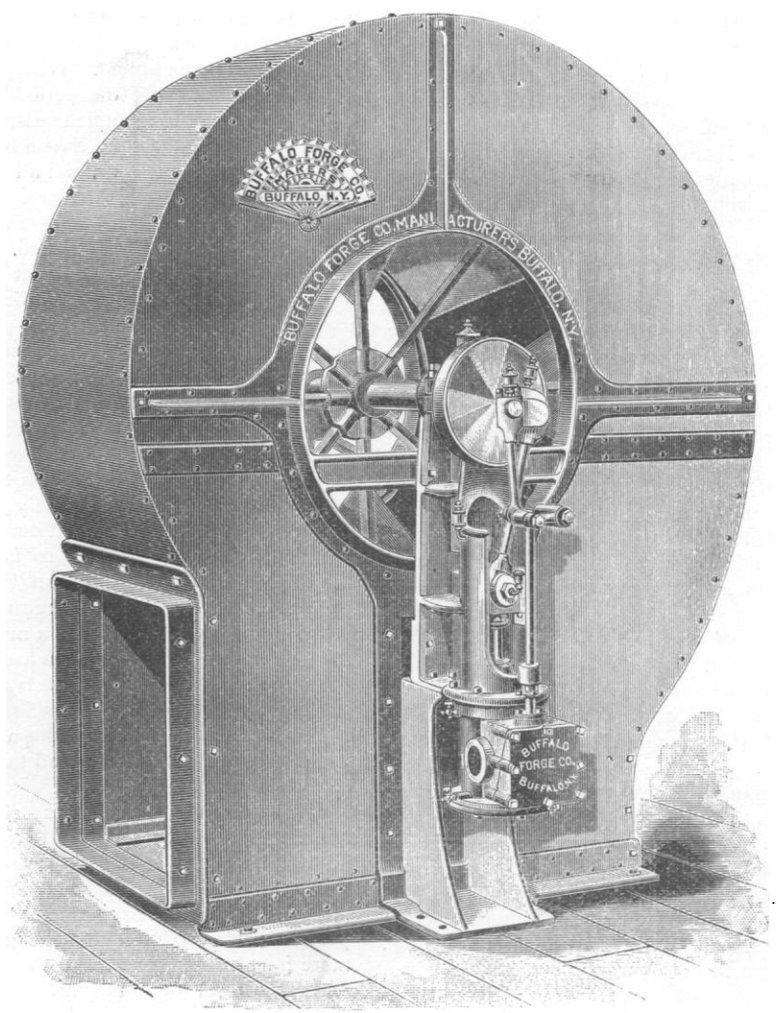
AN IMPROVED STEAM-DRIVEN FAN.

THE accompanying illustration shows a new design of fan driven direct by a vertical steam engine, making a compact and direct-acting piece of machinery. There is no question but that the direct attached engine affords far superior advantages in fan propulsion, there being no slipping or wearing of belts, the rate of speed being easily increased or diminished as occasion requires, perfect control of the fan as to starting and stopping instantly being secured. Where economy of space is an object this combination possesses great advantages, as but little more room than that taken up by the fan itself is required, which is less than that used with a pulley and belt. In some makes of fans with direct attached engines the engine has been attached so as to leave no space between it and the blower, but where perfectly noiseless action is imperative, some space should be left. And when the fan is required for continuous use, the latter is the more satisfactory plan.

The engine shown is for either high or low pressure steam, and runs with very little friction, as it has balanced valves. It is made in sizes ranging from two to fifty horse-power where high-pressure steam is used.

By reference to the engraving, it will be noted that while doing its work, the engine acts as a brace to the blower, the base of which is made of the best angle steel. The amount of bearing surface also deserves comment, being one of the engine's strong points, considering its compact build. In a one-hundred-inch fan the shaft is three inches and a quarter in diameter, and the bearings are fifteen inches and three-quarters long.



STEAM-DRIVEN FAN.

There can hardly be a doubt that the great variety of uses to which blowers may be readily adapted was never realized in the earlier periods of their manufacture; but when one reviews the substantial growth each year in this one branch of the manufacturing business alone, it is no marvel that neither pains nor expense are spared to produce patterns which in design, durability, and

construction are abreast of the times, and fully satisfy the rapidly increasing demand for them.

In order to be a complete success, a direct driven fan should possess high speed, ability to run continuously, and oft-times in the midst of considerable dust, without the engineer's attention at any regular time. These qualities seem to be fully secured in the fan shown, which is made by the Buffalo Forge Company of Buffalo, N.Y.

CLARK UNIVERSITY.[1]

WE are here to mark in a simple way, as befits its dignity, a rare event, which we hope and pray may prove not only the most important in the history of this favored city, but of forever growing significance for our state and nation, for culture and humanity.

Located, with great forethought, in a city whose culture ensures that enlighted public sentiment so needful in maintaining the highest possible academic standards; in a city whose wealth and good will, we trust, are as fair a promise as can anywhere be given or asked of that perpetual increase of revenue now required by the rapid progress of science; in a city central among the best colleges of the East, whose work we wish not only to supplement but to stimulate, whose higher interests we hope to serve, and whose good will and active co-operation we invite; governed by trustees of eminence in the nation as well as in the state, who ask no sectarian and no political questions of their appointees, whose influence without and whose counsels within are of inestimable and well appreciated value; consecrating ourselves to the toil of science at an hour so peculiarly critical and so opportune in the university development of the country, — I must believe that not only every intelligent inhabitant of Worcester, but every unbiased friend of higher education everywhere, will wish to add to our already unexpectedly large endowment of public and private good will at home and abroad, his and her hearty, ungrudging, and reiterated God-speed.

Just because, instead of the easy and wasteful task of repeating what is already well done about us, we strive to take the inevitable next step, and to be the first, if we can, upon the higher plane; because we must study not only to utilize all available experience wherever we can, but to be wisely bold in innovations wherever we must; because there will be indifference and misconception from friends who do not see all the importance of our work at first; because there are difficulties inherent in the very nature of that work itself as great as the work is needed, — we must go slowly and surely, establishing but few departments at first, and when they are made the best possible, adding new and most related ones as fast as we can find the men and money to support them. We must prolong the formative period of foundation, and must each and every one realize well that we are just entering upon years of unremitting toil, in which patience and hope will be tempered with trial. But our cause is itself an inspiration, for it is in the current of all good tendencies in higher education; and of the ultimate success of what is this day begun, there is not a shadow of doubt or of fear.

Our history begins more than twenty years ago, in the plans of a reticent and sagacious man, whose leave we cannot here await to speak of, who in affluence maintains the simple and regular mode of life inbred in the plain New England home of his boyhood, — plans that have steadily grown with his forture, and that have been followed and encouraged with an eager and growing interest, which extended to even minor items, by the devoted companion of his life. Besides a large fund already placed to our account, he has given his experience and unremitting daily care, worth to us large sums in economies, and resulting in well-appointed buildings, and a solidity of materials and a thoroughness of workmanship which I believe are without a parallel of their cost and kind in the country. Not only in the multifarious work of the university office, its methods of estimates, orders, book-keeping, of individual accountability for all books, apparatus, supplies, and furniture, but in the larger questions of university polity without and effective administration within; in the definition of duty for each officer, the strict subordination and the concentration of authority and responsibility sure to appeal to all who have the instinct of discipline, and which are exceptionally needful where the life of science is to be so free, and the policy so independent; in the express exemption, too, of all instructors who can sustain the ardor of research from excessive teaching and examination, in the appointment of assistants in a way to keep each member of the staff at his best work and to avoid the too common and wasteful practice in American universities of letting four-thousand-dollar men do four-hundred-dollar work, in the ample equipment of each department, that no force be lost on inferior tools, — in all these and many other respects, the ideal of our founder has been to make everywhere an independent application of the simplest and severest but also the largest principles of business economy.

As business absorbs more and more of the talent and energy of the world, its considerations more and more pervading if not subordinating, whether for better or worse, not only the arts, the school, the press, but all departments of church and state, making peace and war, cities or deserts, so science is slowly pervading and profoundly modifying literature, philosophy, education, religion, and every domain of culture. Both at their best have dangers, and are severe schools of integrity. The directness, simplicity, certainty, and absorption in work so characteristic of both, are setting new fashions in manners, and even in morals, and bringing man into closer contact with the world as it is. Both are binding the universe together into new unities and imposing a discipline ever severer for body and mind. When their work, purified of deceit and error, is finished, the period of history we now call modern will be rounded to completeness, culture will have abandoned much useless luggage, the chasm between instruction and education will be less disastrous, and all the highest and most sacred of human ideals will not be lost or dimmed, but will become nearer and more real.

When one who has graduated with highest honors from this rigorous school of business, after spending eight years of travel abroad studying the means by which knowledge and culture — the most precious riches of the race — are increased and transmitted, and finding no reason why our country, which so excels in business, should be content with the second best in science, devotes to its services not only his fortune at the end of his life, but also years yet full of exceptional and unabated energy, we see in such a fact not only the normal, complete, if you please, post-graduate ethical maturity of an individual business life, but also a type and promise of what wealth now seems likely to do for higher education in America. It is no marvel that our foundation has already been so often, so conspicuously, and so favorably noted in authoritative ways and places in an European land, where, if monarchy should yield to a republic, university culture could not penetrate its people as it now does. It is thus a more typical and vital product of the national life at its best than are foundations made by state or church in which to train their servants. In thus giving his fortune to a single highest end as sagaciously and actively as he has acquired it, may our founder find a new completeness of life in age, which Cicero did not know, and taste "all the joy that lies in a full self-sacrifice."

The very word "science," especially when used in its relation to business, is too often degraded by cheap graduates who are just fit to look after established industrial processes, but are useless if competition finds or needs new and better ones; who certify to analyses of commercial products that good chemists know are impossible; who, if international competition in manufactures were more free, would give place to better trained, perhaps German, experts still faster than they are doing; who in criminal, medical, and patent-law suits often have the address to carry judge and jury against far better chemists, but who have no conception of the higher quality and more rigorous methods of their own science; who make chemistry, physics, and geology mercenary, culinary, the servants instead of the masters of industrial progress and the very "life-springs of all the arts of peace or war." This evil, although so great and common that even the best men in other professions too rarely see the high ideal culture-power of real science, is yet only incidental and temporary.

A good illustration of the high and normal technological value of pure science is at hand in dyeing, one of the most scientific among

[1] Address delivered by President G. Stanley Hall at the opening of Clark University, Worcester, Mass., on Oct. 2, 1889.