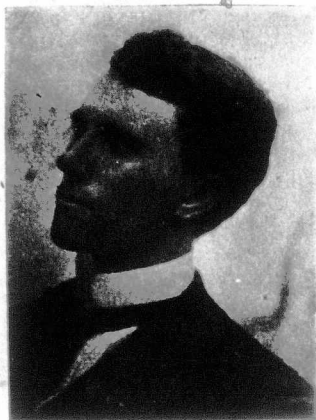


F. S. Challenor, R. C. A.

Although Mr. Challenor was born in London, on account of being brought to Canada at an early age, his education and art training are almost distinctly Canadian. Trained as a lithographer, and having had



F. S. CHALLENGER.

a thorough course at the Ontario School of Art, he became a pupil of Mr. Reid in 1889, and studied under his tuition for three years, after which he spent a year in England. Since that he has made another sojourn of a year abroad. His experience as an illustrator puts him in the front rank as a pen draftsman, and his knowledge of processes of reproduction fits him peculiarly for his position in the Art School. As a painter he is a continuous and active worker, and is distinguished as being the youngest Academician in the Royal Canadian Academy. He is represented in the National collection at Ottawa, and also in the Provincial collection at Toronto. His picture, "Workers in the Fields," won for him a medal at the Pan-American Exposition, Buffalo. His recent work consists more particularly of mural decorations. Challenor's picture which we reproduce is named "Milking."

The Solar Slave.

BY E. H. RYDALL, CALIFORNIA.

For the last twenty-five years mechanical engineers have been engaged in experimenting with machines whereby the rays of the sun can be utilized for the purposes of furnishing power to commerce. The opening of the Twentieth Century is signalized by the success of some of these experiments. To-day, in California, is a machine, now on exhibition at the Pasadena Ostrich Farm (placed there merely for the purpose of protec-

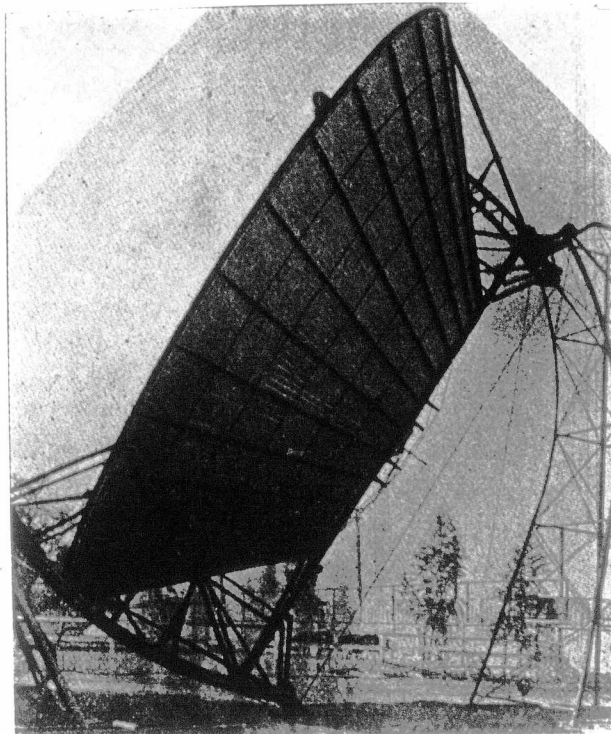
tion), that all day long is pumping water from the earth and illustrating the object of its existence to thousands who know only too well the need for such a contrivance in the arid regions of the west of America. Our illustrations give a very accurate idea of the invention, telling to the untrained eye of the inexperienced in the art its general formation.

A well-known authority in solar physics, Professor S. P. Langley, of the Smithsonian Institute at Washington, reported in the Century Magazine some sixteen years ago:

"Future ages may see the seat of empire transferred to regions of the earth now barren and desolated under intense solar heat—countries in which, from that very cause, will not improbably become the seat of mechanical and thence political power. Whoever finds the way to make industrially useful the vast sun-power now wasted in the deserts of North Africa, or the shores of the Red Sea, will effect a greater change in men's affairs than any conqueror in history has done; for he will once more people those waste places with the life that swarmed there in the best days of Carthage and of old Egypt, but under another civilization, where man shall no longer worship the sun as a god, but shall have learned to make it his servant."

Many thousands of dollars—eighty-five, as I am informed by Mr. C. L. Haskell, who is in charge of the Solar Motor at the Ostrich Farm—have been spent upon unsuccessful machines built to attain the end desired; and now a wealthy syndicate has possession of all the patents relating to the invention and is prepared to carry forward the work of manufacture and publicity.

The Solar Motor is set in meridian on two fixed supports, which balance a frame resting upon an equatorial mounting, the axis being exactly north and south, while the machine turns east and west, following the great luminary. The reflector, composed of 1,788 mirrors, each 3½ by 24 inches in size, is 33 feet 6 inches in diameter on top and 15 feet on the bottom; the weight of the entire contrivance is 83,000 pounds. In the center is a tubular boiler, 13 feet 6 inches in length, holding one hundred gallons of water and yet leaving eight feet of space for steam. The



THE SOLAR MOTOR.

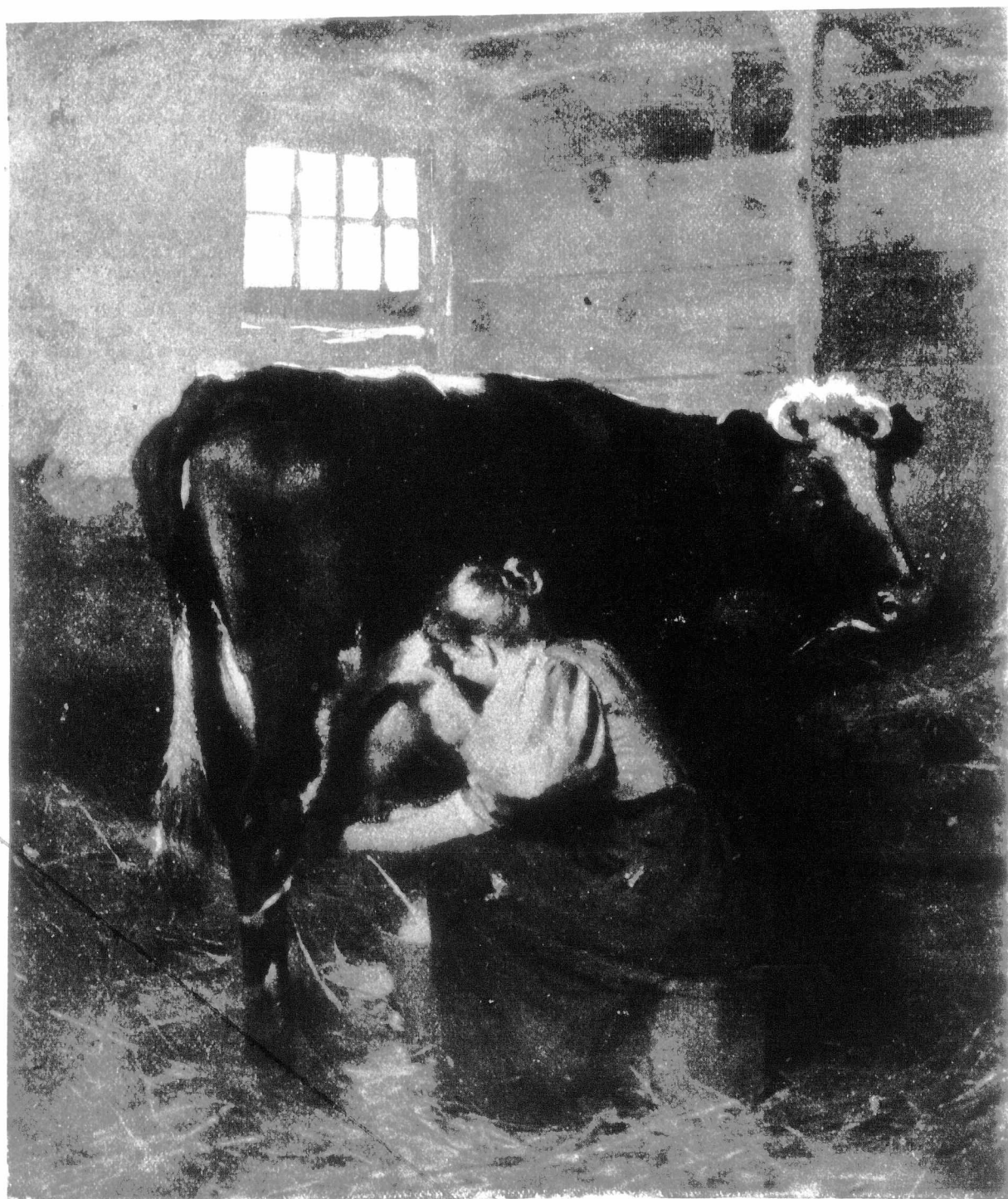
boiler is made of steel, covered with absorbent material. Steam is conducted from this elevated boiler to an engine on the ground, in the vicinity, by a flexible phosphor-bronze pipe, entirely metallic; this pipe is attached to the top of the boiler. The hot, steady, persistent California sun that shines almost diurnally throughout the year, glares down upon the 1,788 mirrors and its rays are reflected upon the tubular boiler in the center. This causes such heat that it is possible to obtain one hundred and fifty pounds steam pressure in one hour from cold water. A youth by simply turning a crank can place the machine in position, for there is an indicator showing when the true focus is obtained. This done, the machine follows the sun all day, catching its direct rays and turning like the hands of a common clock. The engine is automatic, and self-oiling; the boiler is supplied with water automatically and maintained in proper quantity; steam pressure is controlled by a safety valve. In the case of this exhibit at Pasadena, the steam passes from the engine to a condenser and thence back to the boiler to be used again.

The machine works just as well in winter as in summer, if the sun is shining; cold makes not the slightest difference, but, of course, as the days in summer are longer than those in winter, more work can be done at that time by the machine. All day, every day—from about an hour and a half after sunrise to half an hour before sundown, twelve hours—this tireless heat-concentrator supplies power to the community for the various useful purposes of man. This power can be stored in the form of electric batteries, if not required immediately. As an illustration of conserved power, it may be stated that the 36,000-horse-power engines of the Boston Electric Light Company are shut down at six o'clock every evening and the plant then operated from storage batteries.

This illustrative model at the Ostrich Farm develops ten horse power and lifts water at the rate of 1,400 gallons a minute from an underground tank twelve feet deep; this is equivalent to 155 miner's inches, the usual way of measuring water in California. It is entirely feasible to create a much stronger power by grouping several of these circular contrivances around a central engine.

One of the peculiarities of this invention from a thermometrical point of view has been called to my attention by Mr. Haskell. It is the fact that the heat at the top of the boiler, furthest away from the radiating mirrors, is 7,000 degrees, while that at the bottom of the boiler, induced by mirrors at a closer distance, is 2,500 degrees. Another most interesting peculiarity consists in the fact that the lampblack covering of the boiler is one of the most useful and important devices in the whole apparatus, for the reason that should, from any unforeseen cause, the boiler become partially exhausted, so great is the reflected heat that immediately the lampblack would be burnt off, followed by the natural consequences of reflection and the protection of the boiler.

While the exhibit has been on view but a few months at the Pasadena Ostrich Farm, it has attracted the attention of the leading engineers and capitalists of all parts of the United States, for Southern California in winter time is somewhat of a popular rendezvous for the wealthier classes of America. An order has already been placed with the Company for a tandem solar motor of 125 horse power for use in California. Two motors have been ordered by mining companies in Arizona, one of 250 and the other 500 horse power. The actual price of the machine, with a first-class compound condensing engine, condenser and centrifugal pump, is, from 5 to 15



From a painting by Challenor.

"MILKING."