

**HELIOS; A COMPILATION
OF BOILER ROOM
ENGINEERING
INFORMATION**

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HEINE SAFETY BOILER CO.

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OF BOILER ROOM
ENGINEERING
INFORMATION**

HELIOS

A Compilation of Boiler Room Engineering Information

Published by

HEINE SAFETY BOILER CO.

Manufacturers of
Water Tube Boilers



SAINT LOUIS

1912



TJ&S
H 1/2
1912

PHOENIXVILLE, PA., SHOP of the HEINE SAFETY BOILER CO.

HEINE SAFETY BOILER CO.

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Frank Perrot

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St. Louis, Mo.



AMERICAN

Preface to Eleventh Edition.

SINCE Helios was first published, eighteen years ago, many changes in engineering practice have come about, and many of the previously accepted constants which were based on experimental data, have been changed as the result of more refined methods of determination. In order to bring everything up to date the entire text has been rewritten and a determined effort has been made to have all data authentic and accurate. We feel no hesitancy in commending the book as worthy of confidence and for ready reference, to every one who may find use for the material which it contains.

As Helios falls into the hands of all classes of those interested in steam engineering, its scope must be broad, and much of the text will therefore appear elementary to some, but there will doubtless be something of interest to all.

The main value of the book to us lies in its value to others and while it is issued primarily as a piece of advertising literature most of the matter relating to the Heine Boiler has been grouped in the back pages.

St. Louis, January 1, 1912.





HELIOS


Source of All Power! Fountain of Light and Warmth!



Adored by the ancient husbandman as the God who blessed his labors with a harvest of golden grain; revered by the early sage as the great visible means of the divine creative force; pictured by the inspired artist as the tireless charioteer who drives his four fiery steeds daily across the heavens, his head circled by a crown of rays, his chariot wheel the disk of the sun itself.

When primeval man began to think, the sun seemed to him the cause of all those wonders in nature which ministered to his simple wants, or taught his soul to hope. His crude feelings of awe and gratitude blossomed into worship, and we find the sun as central figure in all early religions. He was the Suraya of the Hindoos, the Baal of the Phoenicians, the Odin of the Norsemen, and his temples arose alike in ancient Mexico and Peru. As Mithras of the Persians, he was adored as the symbol of the Supreme Deity, his messenger and agent for all good. As Osiris he received the worship and offerings of the Egyptians, whose priests, early adepts in the rudiments of science, saw in him the cause of the annual fructifying overflow of the Nile.

Modern knowledge, with its vast array of facts and figures, can but verify and seal the faith of these ancient observers. What they dimly discerned as probable is now the central fact of physical science. From him are derived all the forces of nature which have been yoked into the service of man. All animal and plant life draws its daily sustenance from the warmth and light of the sun, and it is but his transmuted energy we expend, when, with muscle of man or horse, we load our truck or roll it along the highway.

Do we irrigate the soil from the pumps of a myriad windmills? His rays, on plains far inland, supply the energy for the breeze which turns their vanes. Does a lumbering wheel drive a dozen stamps and a primitive arastra in some Mexican canyon? Do mighty turbines whirl a million flying spindles and shake thousands of clattering looms on the banks of some New England stream? From the bosom of the ocean and the swamps of the tropics, Helios lifted those vapory Titans whose lifeblood courses in the mountain torrent and the river of the plain. Do a hundred cars rattle up the steep streets of the smiling city by the Golden Gate? Are massive ingots of steel forged to shape and size by the giant hammers of Bethlehem? The fuel which gives them motion was stored for us, ages before man was evolved, by the rays which flash from his chariot wheels! "The heat now radiating from our fire places has at some time previously been transmitted to the earth from the sun. If it be wood that we are burning, then we are using the sunbeams that have shone on the earth within a few decades. If it be coal, then we are transforming to heat the solar energy which arrived at the earth millions of years ago."





Professor Langley remarks that "the great coal fields² of Pennsylvania contain enough of the precious mineral to supply the wants of the United States for a thousand years. If all that tremendous accumulation of fuel were to be extracted and burned in one vast conflagration, the total quantity of heat that would be produced would, no doubt, be stupendous, and yet," says this authority, who has taught us so much about the sun, "all the heat developed by that terrific coal fire would not be equal to that which the sun pours forth in the thousandth part of each single second."

The almost limitless stores of petroleum which are found in America and in Asia, and the smaller, though still vast supplies of natural gas which some favored localities are now exploiting, represent but so much sun-energy transmuted through forests of prehistoric vegetation.

Another authority tells us that the total amount of living force "which the sun pours out yearly upon every acre of the earth's surface, chiefly in the form of heat, is 800,000 horse-power." And he estimates that a flourishing crop utilizes only 4-10 of 1 per cent of this power.

Remembering, then, that this sun-energy reaches us only one-half of each day, we may, *whenever we learn how*, pick up on every acre an average of 175 horse-power during each hour of daylight, as a surplus which nature does not require for her work of food production.

Attempts to utilize this daily waste have been made, and future inventors may fire their boilers directly with the radiant heat of the sun. But whether we depend on what he garnered for us ages ago, or quite recently, or on the stores he will lavish on us in the future, it is clear that man's continued existence on earth is directly dependent on Helios.

In olden times the various trades or guilds chose as their patron saint some prominent person who was thought to have embodied in his life-work the special means and methods of their craft. By that token we claim Helios as our own. He has always carried the record for evaporative efficiency. He provides both the fuel and the water for our boilers. He teaches us perfect circulation, upward as mingled vapor and water by the action of heat, and down again by gravity as rain and river in solid water. It is therefore fit that the boiler in which this perfect and unobstructed circulation is made the leading feature of construction should have HELIOS as its emblem.

In the following pages we give some account of the fuels used in the practical arts, of the water which becomes the vehicle for transmitting their energy into mechanical power, and of the limitations imposed by their varying conditions. These must all be taken into account in estimating how much we may expect of certain combinations of machinery.

We trust that the tables and data may be found convenient for ready reference alike by professional men, by manufacturers, and by that growing class of practical steam engineers who realize that true theory, consonant with collective experience, is within the reach of every thoughtful man who pulls the throttle.

E. D. MEIER.

This explanation of the choice of the word HELIOS, as the name of this book, appeared as the preface of the first edition in July, 1893, and the word has ever since been a prominent feature of our trade mark.

