

# SCIENTIFIC AMERICAN

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[NEW SERIES.]

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## HOLLY'S NEW PUMPING ENGINE AND AUTOMATIC PRESSURE REGULATOR.

Mr. Holly's first works were established in the city of Lockport, N. Y., for fire protection alone, and proved eminently satisfactory. Three years later works on the Holly plan, combining daily supply with fire protection, were built in the city of Auburn, N. Y. The machinery first used in the Lockport works consisted only of a rotary pump, a turbine wheel, and a hydrostatic regulator. Improvements have been made in the mechanism until the compound pumping engine, said to be equal to any other in style, finish, and duty, was produced. This engine, which is the subject of our illustration, was first introduced at the Rochester, N. Y., Water Works in 1873.

The engine consists of four steam cylinders, having four corresponding reciprocating pumps attached by direct connections, and erected on a heavy arched double frame of iron, set at an angle of 90°, one steam cylinder and its pump being placed at each of the four corners. The frame supports at its top a shaft with an overhanging crank on either end, to which the four engines are connected by ordinary connecting rods. The cylinders and pumps are detached at pleasure, and may be run singly, in pairs, or all together, according to the demands for water supply. The engine is

provided with the usual air pump and jet or surface condenser, and by a peculiar arrangement of pipes and valves may be run on either the high, low, or compound steam pressure principle, and may be changed from one to another at any moment by the engineer. This arrangement is necessary to secure economical daily pumping for domestic supply, which is done by compounding steam, and prompt increase of power for efficient fire protection, which is amply secured by converting the machine into a high pressure engine. When compounding, the steam is taken directly from the boilers into one of the cylinders and exhausted into the remaining three; and when running high pressure, steam is taken directly into all of the cylinders, the latter operation increasing the power of the whole, four to eight times. To supply this increase reserve boilers are provided, and to guard against a failure in the water supply duplicate engines are added when the demands of consumers equal one half the capacity of the engines first erected.

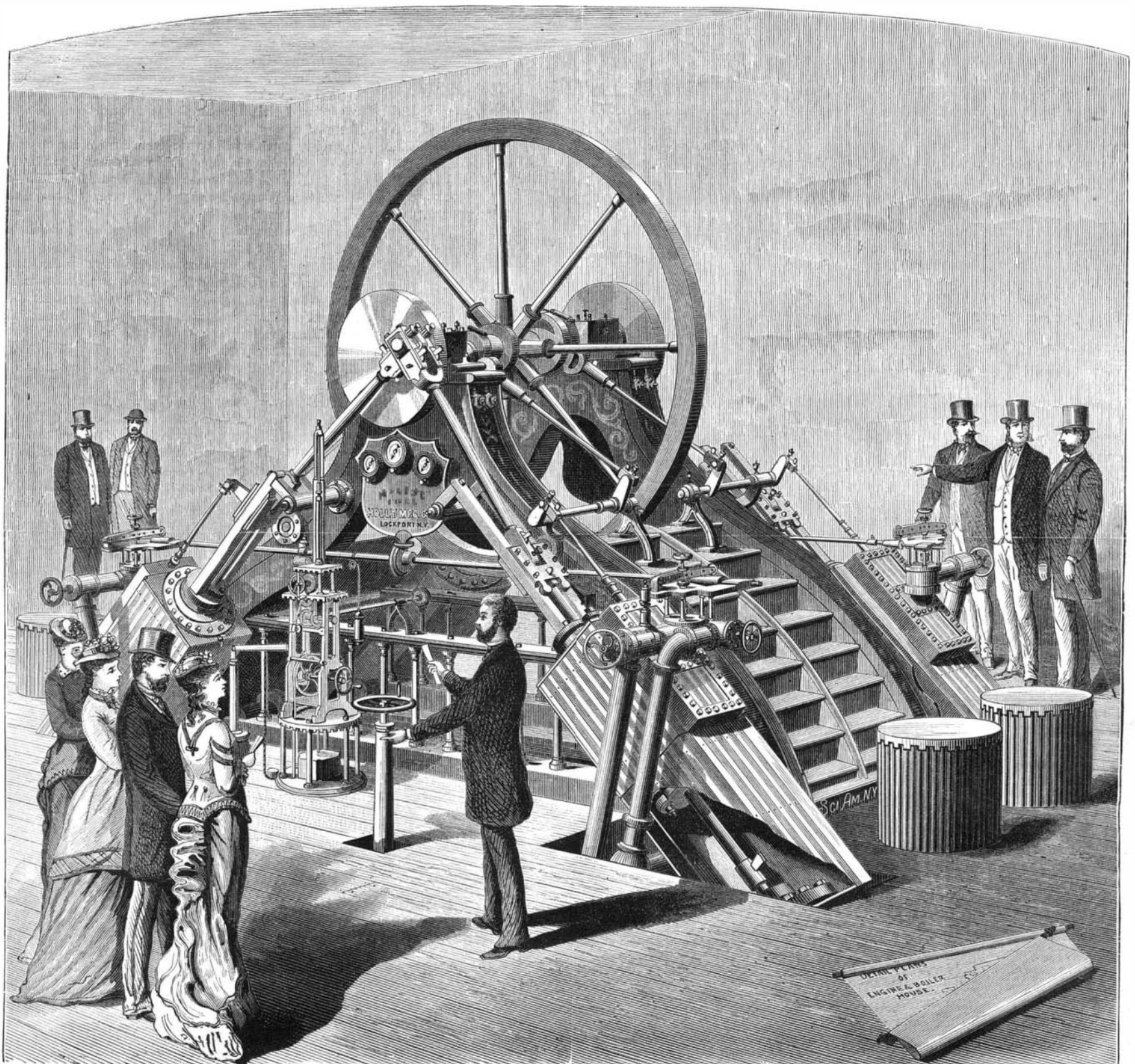
The water is pumped directly into the main, and by means of ingenious contrivances, invented by Mr. Holly, the pressure of the water in the main is made to control the operation of the engines, and in fact to perform faithfully the duty of an engineer.

These contrivances are a successful substitute for the costly

and cumbersome reservoir. They provide for varying pressure, according to varying requirements of communities, whether it be for moderate daily supply or added fire pressure. The varying draughts of water from street mains will add to or diminish pressure in distributing pipes. This variation in pressure in these mains will act upon the regulator placed by the side of the pumping engine, and it in turn quickens or slows the engine to supply just what water is needed. This method of Mr. Holly is new. Starting with the idea of providing a better and more effectual method of fire suppression than is afforded by movable fire engines, multiplied and costly experiments enabled him to combine with it daily supply without the intermediate agency of the reservoir or stand pipe. This system will not only supply cities with water for ordinary purposes at any desired elevation, but it will also furnish the means of extinguishing fires at several points at the same time if necessary, without the use of movable engines for that purpose.

The Holly engine has shown a duty of 76,250,000 ft. lbs. per 100 lbs. of coal. This proves that the Holly pumping engine, as now manufactured, will compare with the best on the score of economy.

It is claimed that the direct or Holly plan commends itself as preferable to the reservoir plan, because the original ex-



HOLLY'S NEW PUMPING ENGINE AND AUTOMATIC PRESSURE REGULATOR.

pense will be less; the annual cost (including interest on debt) will be reduced; the supply will be more regular and reliable throughout the town, including the highest ground; it will not be subjected to as much danger of being cut off by casualties, it will make every hydrant a powerful fire engine, which can be used to put out fires more successfully than by the movable engines which must be used in connection with gravitation works. Under the Holly system there are increased barriers against large conflagrations, and protection against large and fearful losses.

We are informed that underwriters recognize the introduction of this improved method of fire suppression as a reason for reduction in insurance rates.

The validity of Mr. Holly's claims has been disputed by imitators; but the courts have recently, after a long and sharply contested suit, rendered a decision in Mr. Holly's favor, sustaining the broad claim of a new and improved method of supplying cities with water.

The Holly system of water supply and fire protection is in use in 69 of the principal cities and villages in the United States. For further information address the Holly Manufacturing Co., Lockport, N. Y.

STEAM ON COMMON ROADS.

Two years ago the Legislature of Wisconsin offered a prize of \$10,000 for a successful road motor, propelled by steam or otherwise, to be used as a substitute for draught cattle on common roads, and for ordinary agricultural work, as in plowing, thrashing, etc. The text of the law was printed in the SCIENTIFIC AMERICAN for January 29, 1876. The test of success was to be the performance of a journey of at least two hundred miles on the common roads of the State at an average rate of five miles an hour, working time. It was also stipulated that the machine should be so constructed as to run in the ordinary wagon track, to be able to run backward and turn out of the road for the passage of other vehicles, and to be able to overcome a grade of at least two hundred feet to the mile. A board of three Commissioners, including Mr. G. M. Marshall, the member to whom the passage of the law was chiefly due, was appointed by the Governor to witness the prescribed test, and such others as they might suggest.

The effect of the law has clearly been to stimulate in a marked degree the inventors of the State, seeing that at a competitive trial appointed for July 15 two Wisconsin machines were entered, and others from Milwaukee and Madison had been offered, but failed to appear at the advertised time for starting.

The competing machines were the "Oshkosh," invented by Schomer & Farrand, of Oshkosh, and the "Green Bay," owned by the Cowles Brothers, of East Green Bay. The latter proved the more speedy for short distances, but broke down so often that it was practically out of the race. The "Oshkosh" made the trip from Fort Howard to Madison—201 miles—in 33h. 27m., thus beating the prescribed time over 6½ hours. Over the sand hills between Waupun and Watertown the machine is said to have traversed 32 miles in a little over four hours. Another quick run was made between Watertown and Fort Atkinson, 21 miles, in two hours and ten minutes. Most of the distance traveled is said to have been through heavy sand and gravel. The engineers report no breakages on the trip, no scaring of teams, and not a bridge plank disturbed. Throughout the trip the machine hauled a wagon weighing 3,500 lbs. While on exhibition at Oshkosh this load was increased by about five tons of green lumber. The machine alone weighs 4,800 lbs., with water and fuel 6,600 lbs. At Fort Atkinson a plowing trial was had, the details of which have not come to us.

The advantages to be gained by the adaptation of steam to ordinary road traction are enormous, and the behavior of the "Oshkosh" shows that practical success in this direction is not far off. The wisdom of the Wisconsin Legislature in offering the bounty needs no better demonstration. The result is prettily sure to be one, perhaps several, practical motors, which must add greatly to the industrial power and wealth not only of Wisconsin, but of the world.

The Commissioners report that the "Oshkosh" not only made the prescribed trip of 200 miles within the time allowed, but also hauled loads, plowed, and otherwise accomplished in a successful manner every test mentioned in the law or suggested by the Commission. They are not satisfied, however, that the machine is, in the spirit of the law, "a cheap and practical substitute for the use of horses and other animals on the highways and farms." They find it unquestionably of great advantage in plowing, thrashing, and heavy hauling from farm to farm, and on the highways, but it costs \$1,000, and requires a daily expenditure of from \$2 to \$6 to run it. Consequently the Commissioners decline to give it the prize offered by the Legislature, though they propose that the Legislature shall make a proper award for what has already been accomplished. Seeing that nearly three years remain before the time of the legislative offer expires, there would seem to be still a sufficient opportunity for inventors to win the prize, and, as a matter of course, the larger fortune which surely awaits the creator of a practical motor for common roads.

THE 28th Annual Exhibition of the Maryland Institute for the Promotion of the Mechanic Arts will open on Wednesday, October 2, at Baltimore, and continue for five weeks. For particulars see advertisement in another column.

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(Illustrated articles are marked with an asterisk.)

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THE ECLIPSE OF THE SUN, JULY 29, 1878.

In accordance with previous calculations the moon occupied such a position, on the above date, between the sun and the earth, as to throw its shadow upon the latter, causing a total eclipse of the sun's light throughout a long stretch in this country and a partial eclipse elsewhere. The path of the total eclipse here was 116 miles wide and about 2,000 miles in length, beginning at the northwest corner of Idaho and extending through parts of Montana, Wyoming, Colorado, Kansas, New Mexico, Indian Territory, Texas, and Louisiana.

Favorable weather prevailed all along the line of totality, except to a limited extent in Texas, and all the parties of observation report excellent results. East of the Mississippi no observations of value were made, the sun being obscured by clouds.

From Rawlins, Wyoming Territory, Professor Henry Draper reported four splendid photographs of the corona. Two, taken with his large diffraction grating, show the corona to have a continuous spectrum; thus indicating that the light of the corona is derived by reflection from the sun, and is not that of an ignited gas. The photograph of the corona taken with the large equatorial is described as very sharp and full of detail. Edison's tasimeter distinctly showed the heat of the corona, but was too sensitively adjusted. The observations made with it demonstrated that the heat of the corona is much greater than that of the fixed stars, but exact measurements were impossible, the heat throwing the light ray entirely off the galvanometer scale. Professor Barker's observations showed no bright lines in either the inner or the outer corona. The green line could not be detected, nor were any protuberances seen. The Fraunhofer lines were observed by both Dr. Draper and Professor Barker, and their observations were confirmed by those of Professor Morton. The last named described the corona as brilliantly white, with a marked prolongation of bright rays in a direction diagonal to the horizon. His observations proved the light of the corona to be radially polarized. He saw no protuberances.

At Separation, Wyoming, Professors Lockyer, Newcomb, and Watson obtained equally good results. Professor Lockyer observed the eclipse with a small Rutherford grating in front of an ordinary camera. His observations confirm those of Dr. Draper. The corona was much less bright than during the eclipse observed in India, and new phenomena were consequently visible. Professor Newcomb thinks that he detected a new fixed star in the vicinity of the sun, but further researches will be needed to confirm the observation. Professor Watson is quite positive that he saw an inter-Mercurial planet—possibly the much-disputed Vulcan—about 2½ from the sun, appearing like a star of 4½ magnitude.

From Pike's Peak, Colorado, Professor Langley reported successful observations by Gen. Meyer and the Washington and Pittsburg party. The corona was elongated, twelve diameters of the sun on one side and three on the other. It resembled the zodiacal light. At Denver, Professor Young discovered no ultra red or ultra violet lines. At the moment of totality the Fraunhofer lines were beautifully reversed, confirming observations made in Siam. Both of the H lines were reversed. Very bright lines were seen near B, confirming Poyson's observations. Professor Young also saw as bright lines F and 1474 Kirchhoff. Professor Colbert's observations tended to show the moon's path to lie further to the southward than is indicated by the lunar tables, or else that the estimate of the moon's diameter is too large; perhaps both. Measurements made by Mr. Easterday indicated that the corona extended fully 700,000 miles outward from the sun. The chromosphere was distinctly seen by Professor Hough, indicating a thickness of some 2,000 miles. No prominent protuberances were seen.

The Naval Observatory party at Creston, W. T., were quite successful. Professor Harkness, assisted by Lieut. Sturdy, searched for ultra violet lines, using a Rutherford diffraction grating, but found none. With the equatorial camera, Messrs. Clarke and Skinner obtained six good photographs, and Prof. Robinson four with a polariscopic camera.

At Santa Fé, New Mexico, Professor Rock, astronomer of the Wheeler Survey, assisted by Signal Observer Frost, made successful observations of contact, and obtained a valuable series of meteorological observations.

At Fort Worth, Texas, the four contacts were observed under the most favorable conditions. Five photographs were taken during totality, two of them polariscopic. The results confirm those of Professors Young and Harkness. The reversal of the Fraunhofer lines was observed, and line 1474 was measured. Three large pearl-white prominences were seen.

At West Las Animas, Colorado, only a few small prominences were seen. The contacts were later than the American ephemeris prediction, and the duration shorter. Observations of the corona were numerous and successful. At other points less important observations were made. The reports concerning the effect of the darkness on the lower orders of creation are very conflicting. The darkness was marked, but not intense.

Altogether the results obtained by the various parties of observation are such as to promise great additions to our knowledge of the sun, as soon as they can be properly worked out.

A PASTE formed by mixing powdered glass with a concentrated solution of silicate of soda makes an excellent acid proof cement.