

THE NEW OTTO SILENT GAS ENGINE.

This engine is the latest and most complete of thermodynamic motors. In it a sustained pressure is utilized on the piston by a quick combustion—a feature which was the lacking element in the previous forms of explosive engines. The following explanation will suffice to make clear the essential features of this new contrivance.

Instead of the usual explosive mixture of gas and air, used up to the present time in explosive engines, a diluted mixture containing more air than the complete combustion of the gas should require, is introduced in the cylinder by the first outstroke of the piston; in the following instroke this charge is compressed to a certain degree, and at the end of the stroke is ignited by slide lights. By this manner of compressing a diluted mixture, which, at ordinary atmospheric pressure would enter into combustion too slowly to produce any useful effect, the particles of the gases having been brought more within the range of chemical attraction, will produce a combustion quick enough to develop the maximum pressure at the beginning of the stroke. Such a compressed weak or diluted mixture will burn more slowly than one containing a higher percentage of gas, while the heat resulting from the combustion is imparted to the non-combustible portion of the mixture, expanding it and giving that sustained pressure, before alluded to as a desirable feature, to be transformed without jars or shocks into useful work. The mechanism may be more fully comprehended by reference to the accompanying engraving.

The gearing of the engine is operated by a shaft running longitudinally with respect to the cylinder. Motion is imparted thereto by conical wheels from the crank shaft in such manner that the latter makes two revolutions while the former makes one. The shaft actuates the slide by one crank and one connecting rod, and by means of this slide, the functions of giving inlet to gas and air, and of igniting the charges each at the proper instant, are performed. This slide works with its inner side against the cylinder head, and with its outer side against the face of the slide cover or cap, which is pressed by springs against it, and furnishes an equilibrium against the pressure.

An arrangement that acts as an automatic regulator of the amount of fuel consumption in relation to the amount of work thrown on the engine is the combination of the governor and the valve-actuating mechanism, which maintains a constant speed whether the engine is working full power or with no load, while the number of effective strokes, or of combustible charges taken in per minute, will vary; so that when the engine runs idle, it will have one revolution only for four revolutions of the gearing shaft, while a charge of gas and air is introduced; but while doing the full work, gas will be admitted by the governor on each revolution of this shaft. Besides the advantage derived therefrom, with respect to economy, that of not having the speed slackened down when work is thrown on, or having the engine running away when some is taken off, will often be of importance when the work requires a varied and constantly changing amount of power, as in the case of hoisting, etc.

The exhaust of the engine is operated by a lever and a cam moving the escape valve. Two automatic oil cups on top of the cylinder, moved by a small shaft and pulley, as soon as the engine is running, deliver a certain number of drops of oil to the slide valve and the cylinder and piston, and thereby the only attendance left for lubricating has been almost entirely confided

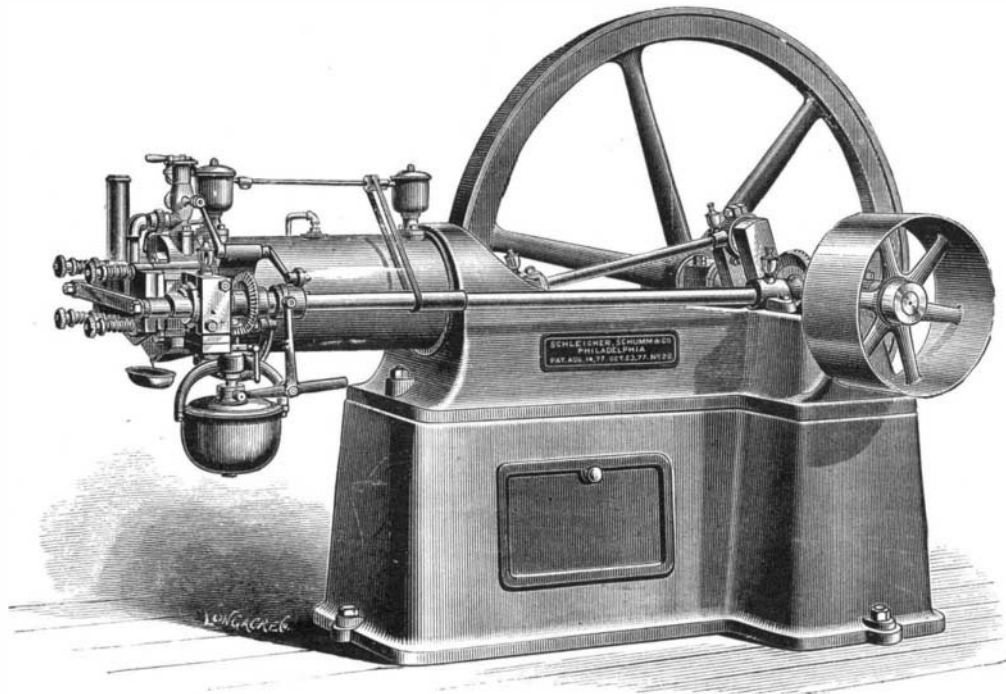
to the engine itself. An automatic arrangement is furthermore provided to stop the inlet of the gas, in case the engine should stop accidentally and thereby waste the gas that might escape should the engine stop in the position where the gas valve would be open.

The total cost of running may be said to be represented by the expense of the gas, and as the quantity of gas required for the "Otto" has been reduced materially, as compared with former gas engines, the expense has been made very low as a total. From a correspondence in the London *Engineering* the consumption appears to be 21.5 cubic feet per hour per indicated horse power, which would give, at our prices for gas of \$2 to \$2.50, a cost of 4.3 to 5.4 cents, and

horse power have already been largely and successfully applied, as well as for other similar intermittent work, as the running of electro-magnetic machines, ventilating of public halls, theaters, etc. Even in large industrial establishments gas engines have been used to run single machines at night, for which the principal engine could not be kept running, and as a reserve engine that can be started at once in case any accident or breaking should occur in the regular power, and require an expensive stoppage, might be found very valuable help.

To gas companies the Otto silent gas engine opens a new field for the use of gas, so threatened by the last advances of the electric light and Mr. Edison's promises, as to become the cause of anxiety to gas stock holders. By the moderate quantity of gas that the new gas engine requires, gas companies have a means of bringing the question of gaseous fuel, in course of a little time, to a practical solution; and when the electric light shall be turned on and off in private houses, as the gas is now, the gas companies will supply their product in larger quantities, during a longer time, and at a much cheaper rate for fuel and power.

The engine, as shown in the illustration, is designed by Messrs. Schleicher, Schumm & Co., engineers and machinists, 3045 Chestnut street, Philadelphia, which firm controls the sale of the Otto gas engine in this country.



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where special rates are given for gas consumed as fuel, the cost would be less. By reason of the cut-off arrangement, the above gas consumption is, however, seldom reached in practice, the average cost being often only 0.25 or 0.5 of the above maximum rate. The safety of gas engines, which leave insurance policies unaffected, the saving of time in their handling, from their general convenience, and their complete cleanliness, do away at once with a great number of small expenses and items of trouble, and will therefore leave the balance of all expenses very much in favor of gas engines. Their peculiar advantages make gas engines highly suitable for use in printing offices, where generally from 2 to 7 horse power are required. For hoisting in stores and warehouses on account of their constant readiness, complete safety, and little attendance, engines up to fifteen indicated

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A Humane Dog.

Two gentlemen who were passing a house in Worcester, Mass., recently, were attracted by a large Newfoundland dog, which kept running toward them and then returning in the direction of a pond in the grove, where something was evidently wrong. They fol-

lowed the dog to the pond, where they found another dog in the water and unable to get out. His front paws were on the curbstone, but he could not get sufficient hold to draw himself up. He was nearly exhausted, and would probably have been drowned had not the gentlemen assisted him. The dogs showed their gratitude in unmistakable signs.

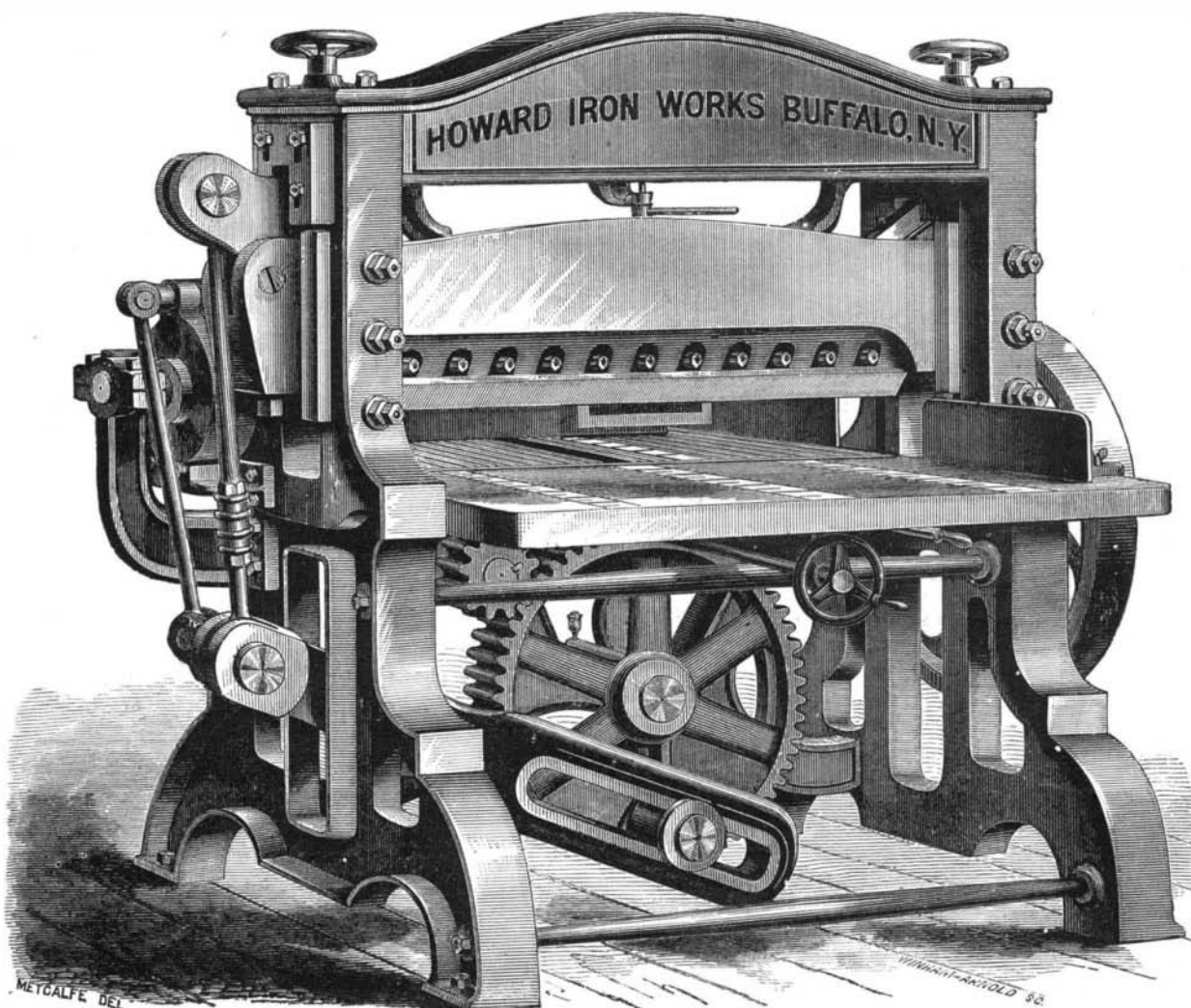
It is the intention of the publishers to make the *SCIENTIFIC AMERICAN*, during the coming year, better, handsomer, more useful, and more interesting than it has ever been before. In the way of illustrations, we have in progress of execution some choice original subjects for the new volume.

THE DIAMOND SELF-CLAMP PAPER CUTTER.

The accompanying engraving shows a new paper cutter

manufactured by the Howard Iron Works, of Buffalo, N. Y., under E. Schlenker's patent. These machines are made in various sizes ranging from 32 inches to 62 inches. They are well designed and strongly built, as will be seen from the engraving. The machine cuts any size of paper or card rapidly and smoothly, and is provided with an automatic clamp for holding the paper, which is applicable to all thicknesses without adjustment, and its pressure on the paper may be varied from 50 to 5,000 lbs. The clamp is provided with an indicator that marks the cutting line on the paper. This improvement, it is stated, is possessed exclusively by this machine. The knife has a positive motion and quick return. The table is provided with wooden cutting sticks, and is divided into lines, squares, and inches.

This machine took the first premium at the Centennial Exhibition, and is used by many of the first printers and stationers in this country.



THE DIAMOND PAPER CUTTER.