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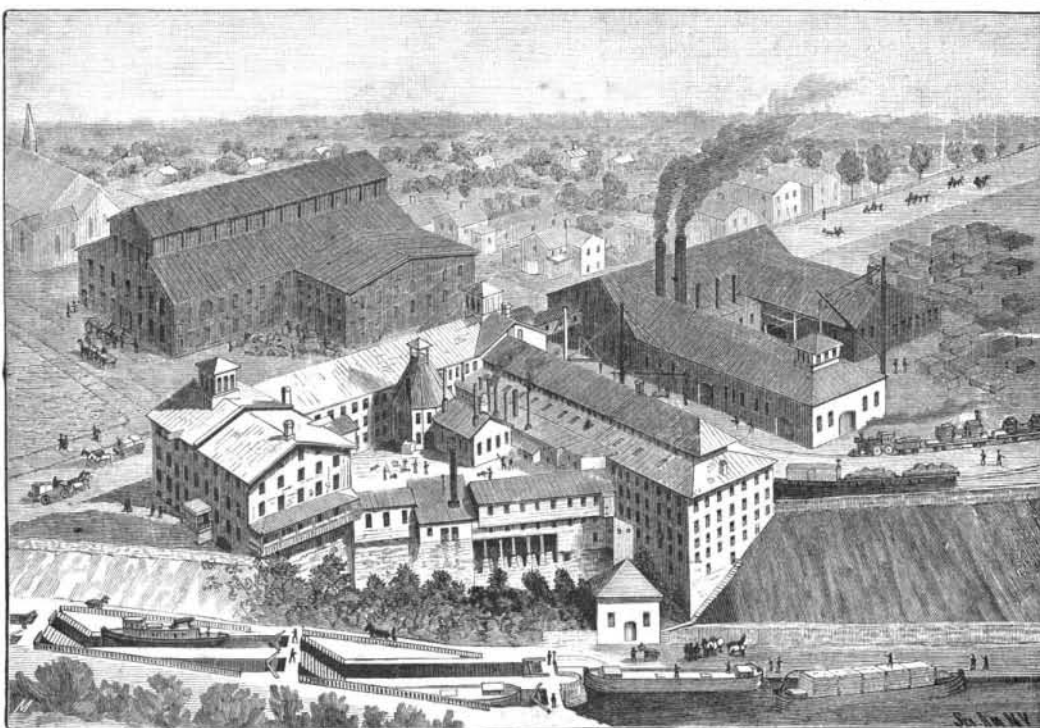
[\$3.00 per Year.]

WORKS OF THE HOLLY MANUFACTURING CO., AT LOCKPORT, N. Y.

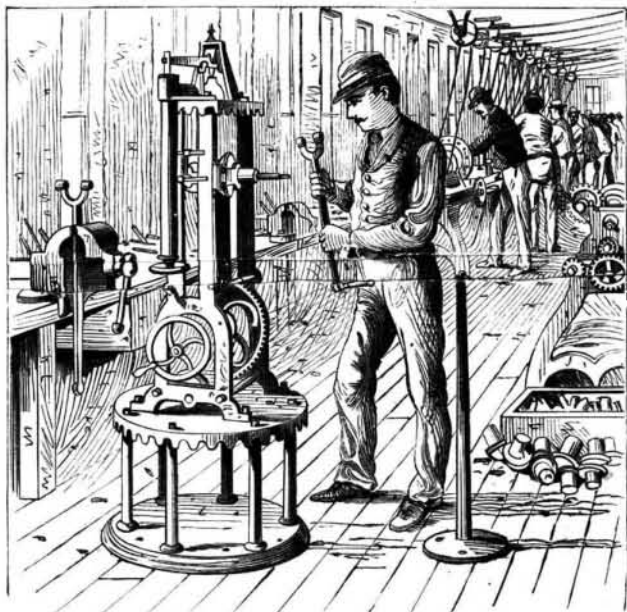
In the present issue we give illustrations of the works of the Holly Manufacturing Company, of Lockport, N. Y. The company is an old one, having been organized in 1859. It was originally devoted to exploiting the inventions of Birdsill Holly, the originator of the widely known Holly system of water works. This system provided for the supply of water at constant pressure without reservoir or standpipe, the pumps working directly into the mains.

Since those early days it has acquired new prominence by the production of the Gaskill pumping engine, the invention of Mr. H. F. Gaskill, now chief engineer of the company. Various improvements had been introduced by Mr. Holly in the pumping engines used in his system. His last development was the quadruplex engine. In this form four steam cylinders are used, inclined in two pairs at 45° from the vertical and toward each other. In the prolongation of the steam cylinders are four water cylinders. This engine worked perfectly. The first one was erected at Dunkirk, N. Y. This engine was built later on the compound principle, and the first compounded one was erected at Rochester, N. Y., in 1874, about three years after the invention and development of the original quadruplex engine.

It was in 1882 that the Gaskill engine was invented which has since superseded all others made by this company. In its high duty, with its features of general excellence, it may be pronounced unsurpassed. In the early days of hydraulic engineering in this

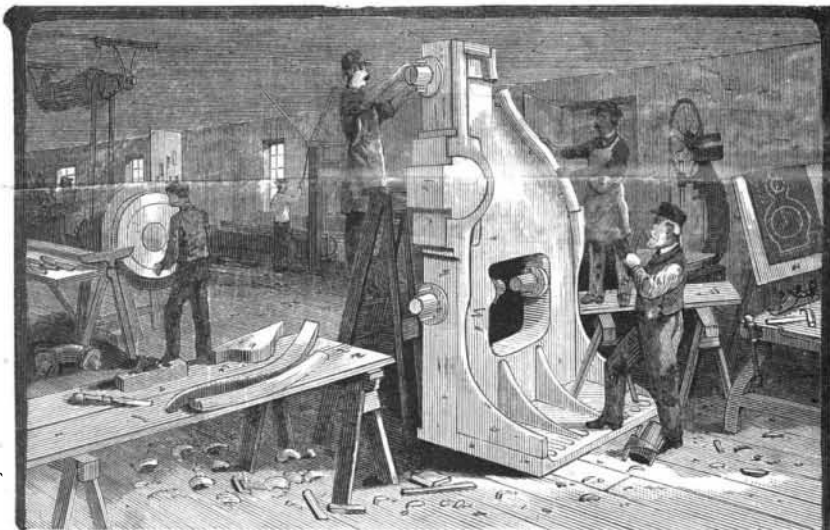


GENERAL VIEW OF THE WORKS OF THE HOLLY MANUFACTURING CO.

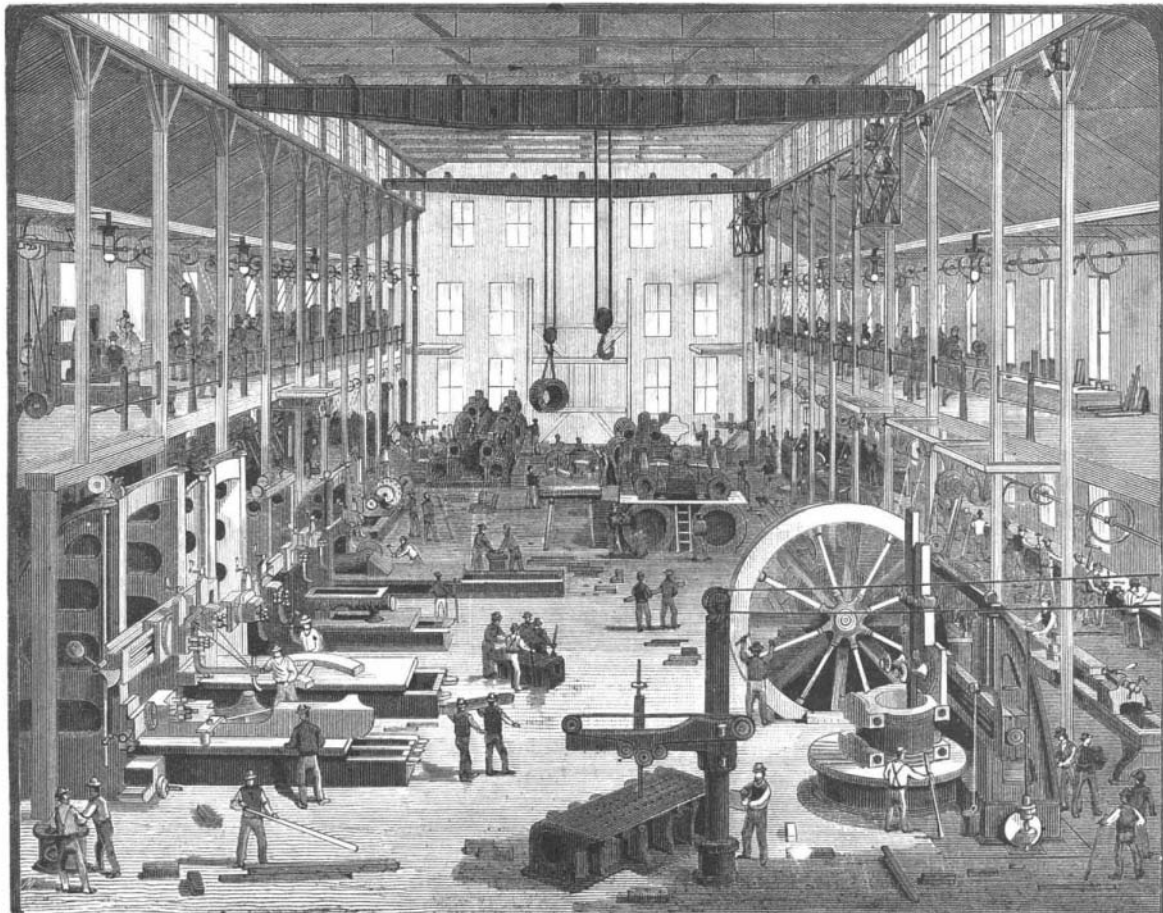


THE UPPER SHOP.

country, but little attention was paid to the duty question. As long as an engine pumped enough water and ran day after day without exacting extensive repairs, the engineer was satisfied. But when the economy of fuel began to be felt as a more important issue, and when rival engine builders began comparing their figures of foot pounds per 100 pounds of coal consumed, Mr. Gaskill addressed himself to the task of developing an engine that should compare favorably with the best. In 1882 his first production was set up in Saratoga Springs, N. Y. This engine has been in constant use for

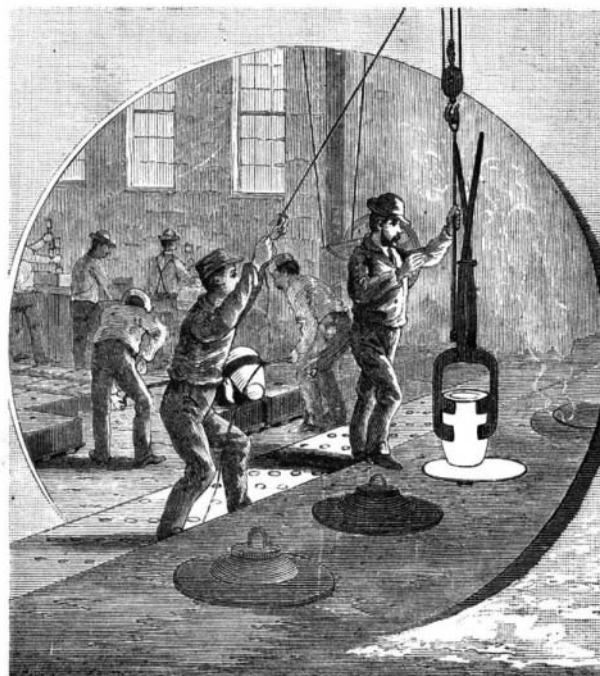


THE PATTERN SHOP.



NEW ERECTING SHOP FOR GASKILL HORIZONTAL COMPOUND PUMPING ENGINE.

the intervening years. The engineer has made daily records of its work. From these it appears that this pioneer engine of the Gaskill type has given since its erection an average duty of about 105,000,000 foot pounds per 100 pounds of coal burned. This it does without being worked to more than one-half its full capacity. Working up to its entire power, it can raise
(Continued on page 4.)



THE BRASS FOUNDRY.

WORKS OF THE HOLLY MANUFACTURING CO.

(Continued from first page.)

5,000,000 gallons daily. The head it works against is over two hundred feet.

This result attained in the first engine of a new

a small square building is seen. In this is placed a turbine water wheel. The water to drive it is drawn through a long tunnel from the upper level of the canal above the last lock. This is the lake level, so that the works possess uninterrupted communication

forth with them. He can be seen in the cage on the right of the crane. The planing and general machinery here is of large size, as very heavy work has to be executed.

In the old erecting shop other classes of machinery are built, such as the Gaskill vertical and horizontal direct-acting engines. This shop naturally is not equal to the newer erection in conveniences for work. One of the vertical engines nearly complete is seen in the foreground to the left.

A view in the pattern shop gives some idea of the scale of work done there. The pattern on which the men are shown engaged is for a portion of the 20,000,000 gallon pump now in process of construction for the city of Buffalo, N. Y.

In the lower shop a great variety of work is executed. In it may be seen one of the small direct-acting pumps built for works of the more moderate size, where economy of first cost as far as compatible with perfect machinery is the great object.

The patterns go from the pattern makers to the iron foundry. Here the moulds are made, and the castings are executed. This immense building is supplied with every facility for the many kinds of work carried out. The drawing gives the general interior arrangement, and shows the size of flasks and moulds required. Overhead is a traversing crane, and jib cranes in addition thereto command the general area of the floor.

The brass work, journals, etc., of the engines are also executed on the grounds. The illustration of the brass foundry represents the men at work drawing out one of the crucibles from the furnace, while in the background the liquid metal is being poured into the moulds.

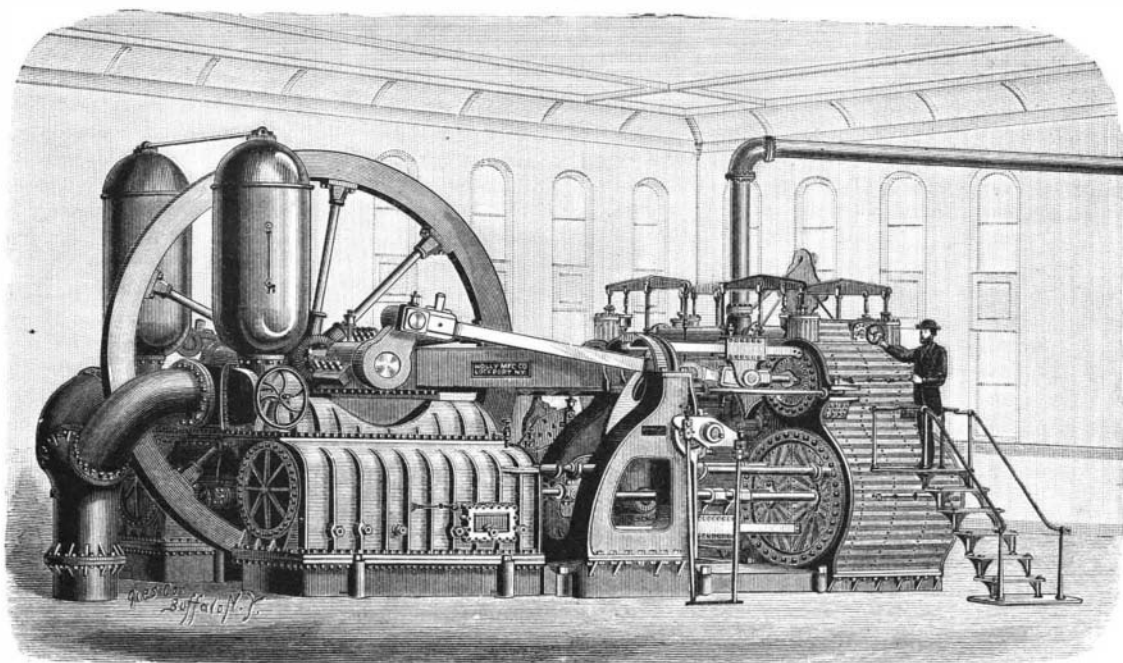
In the cut of the upper shop, devoted to the lighter work, one of the Holly regulators can be seen. This apparatus is used when the Holly system of water supply is introduced. It acts upon the cut-off of the engine. A dial with movable hand is carried by it. This hand is

set to any desired figure denoting the water pressure. This being done, if the pressure rises, the cut-off is shortened, or if the pressure falls, it is lengthened. Fluctuations are inevitable, owing to varying demands upon the supply. The apparatus, if the reduction calls for it, can even cut the steam off entirely. The distinguishing peculiarity about it is that it does not act directly upon the cut-off mechanism. It only throws into action gearing connected with the engine, so that the latter does the actual work of regulating the cut-off. A safety cylinder is supplied to act as auxiliary in case of sudden rise of head.

The works are now engaged on some thirty-one pumping engines, ranging from one to twenty millions of gallons daily capacity.

In addition to the pumping engines and machinery

for water works, the Holly Manufacturing Company is largely engaged in the manufacture of fire hydrants and water valves, having a large shop adapted for this work, which is not shown by any of our illustrations. Hydrants are built of all sizes, and adapted for fire ser-



HORIZONTAL CRANK AND FLY WHEEL PUMPING ENGINE.

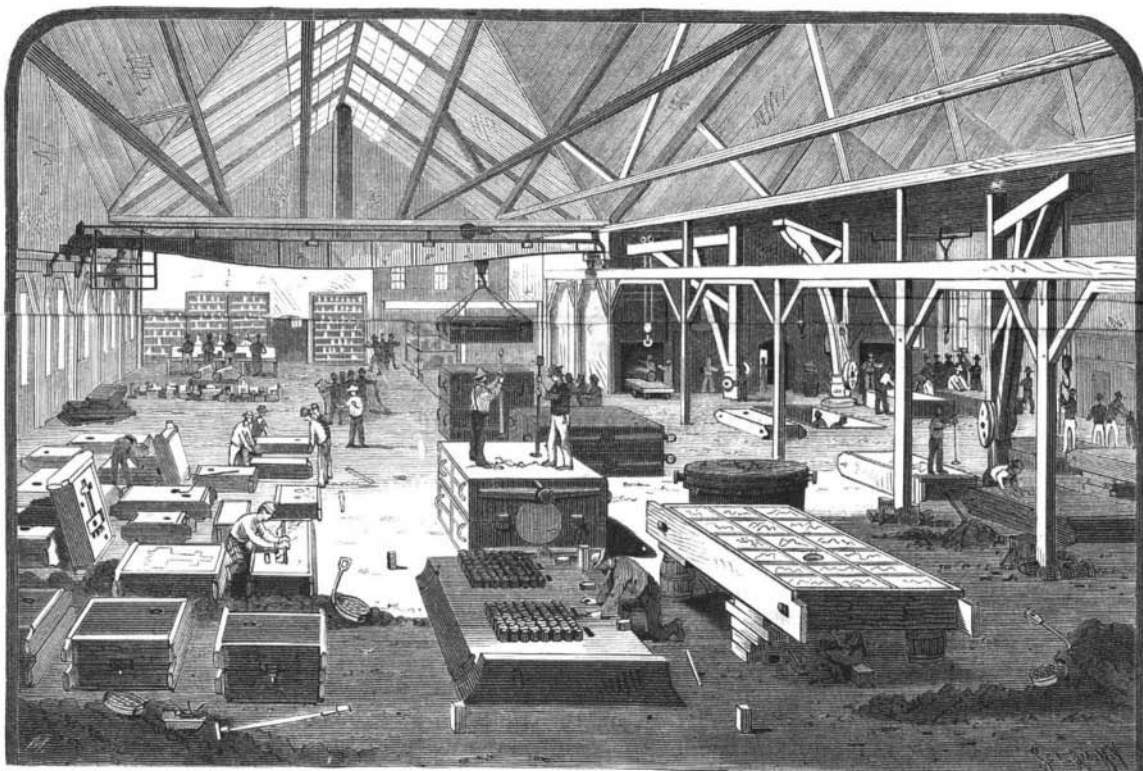
type, and verified by over fourteen hundred days' average, is highly creditable. Since the period when that engine was built, eighty-five of this particular type have been sold by the Holly Manufacturing Company. These engines represent a total daily capacity of three hundred and sixty-two millions of gallons. Mr. Gaskill's efforts in designing this engine were to combine with the utmost simplicity of construction possible a high economy of working. A low original cost was also kept in mind. The engines are constructed both vertical and horizontal, simple and compound. As a representative specimen of the engine, we give an illustration of the compound horizontal engine.

The high pressure cylinders lie above the low pressure ones. The steam connections between the two are straight and direct, and the steam is admitted to the low pressure cylinders by slide valves. The high pressure cylinder is supplied with steam by poppet valves, forced to their places by springs contained in dash pots. The four oscillating or rocking beams for working these valves can be seen directly above the steam chests. As the high pressure piston is on its back stroke, the low pressure piston is executing its forward stroke. The two are connected by a short walking beam, which works in a vertical plane, between the guide bars of the parallel motion. Short links connect its ends with the piston rods. The main pitmen are connected to the upper end of the walking beam. These drive the fly wheel. The pump cylinders are in the line of the lower or low pressure cylinders, so that with them they preserve the relation of a direct-acting pump. The pump valves are of bronze and India rubber, and work by gravity only. The displacement is by a plunger working through a diaphragm in the center of the water chamber. A full study of the engine, which our space is too limited to afford, is of much interest, and would afford a highly instructive lesson in steam engineering.

The immense advance made by this improvement in the matter of duty may be inferred from the fact that the highly approved Holly quadruplex engine has shown a duty varying from 54,000,000 to 87,000,000 foot pounds, while the Gaskill engine at about its lowest record has given a duty in foot pounds of 102,000,000, and has gone as high as 125,907,000, at Buffalo, N. Y. Among the noted pump engines of the world these figures have only been surpassed in one or two isolated instances.

The works of the Holly Manufacturing Company are situated at Lockport, N. Y., on the Erie Canal. The famous locks are next to the works, and are seen in the foreground of the view. Directly on the towpath

with the waters of Lake Erie. A tunnel is excavated in the solid limestone rock for the conveyance of the water. The total fall is fifty-six feet, and with some recent extensions it supplies not only power enough for the use of the factory, but leaves a large surplus



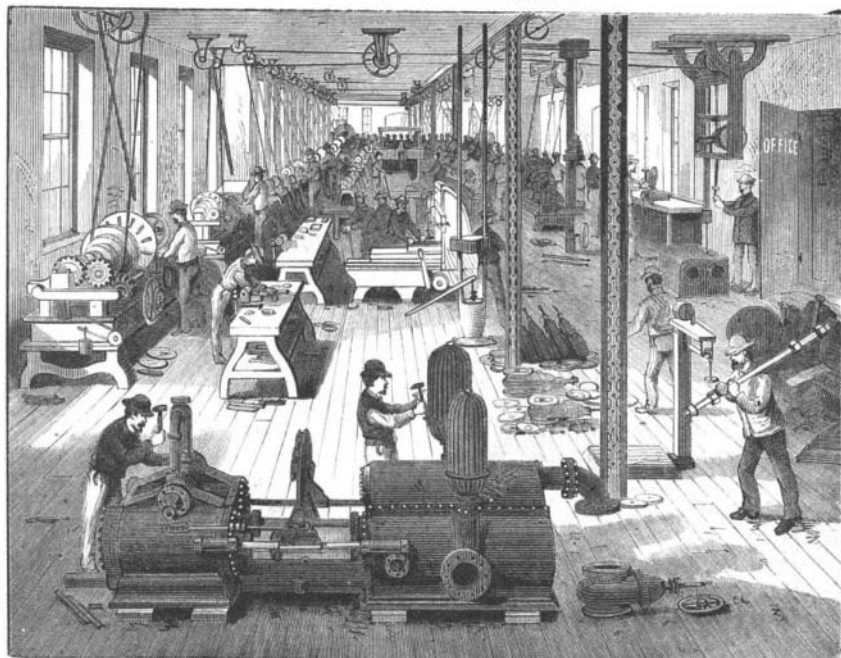
GENERAL VIEW OF THE IRON FOUNDRY.

which can be leased for other industries. It is safe to say that the water power is unsurpassed.

From the turbine house the power is carried by shafting to other parts of the factory. The works cover an area of $4\frac{1}{4}$ acres, and the power is supplied thus to all the shops. The N. Y. C. & H. R. R. is near at hand, and the company have a switch connection with this road. This gives facilities for canal or railroad shipments. The buildings are all of the limestone of the vicinity.

Some idea of the extent and equipments of the shops can be obtained from the views we present of the interiors of the various departments. In them four hundred and fifty men are employed.

The new erecting shop is devoted principally to the construction of the Gaskill horizontal compound pumping engine. Its admirable interior arrangements are evident. Overhead, two traveling cranes worked by square shafting traverse the length of the building. The attendant who directs their movements is carried back and



THE LOWER SHOP.

vice either with hose connections to throw streams directly from the hydrants, or with steam connections, as desired.

DUTIES OF GASKILL ENGINES.

Place.	Capacity.	Duty.	Experts.
Saratoga, N. Y.	5,000,000	112,899,983	Prof. D. M. Greene, C. E., Troy, N. Y., and J. W. Hill, M.E., Cincinnati.
Saratoga, N. Y.	5,000,000	106,838,000	Chas. T. Porter, C.E., New York City.
Omaha, Neb.	5,000,000	102,000,000	J. D. Cook, C.E., Toledo, O.
Columbus, O.	10,000,000	115,400,000	T. C. Mendenhall, C.E., Washington, D. C.
Buffalo, N. Y.	15,000,000	125,907,297	Jno. W. Hill, M.E., Cincinnati, O.
Leavenworth, Kan.	5,000,000	110,478,000	Thos. J. Whitman, C. E., St. Louis, Mo.
Hyde Park, Ill.	12,000,000	110,600,000	Chas. Hermann, C.E., Louisville, Ky.
Lima, O.	3,000,000	110,482,946	J. D. Cook, C.E., Toledo, O.
Erie, Pa.	5,000,000	122,442,491	F. A. Scheffler, C.E., Erie, Pa.
Chicago, Ill.	2 12,000,000	102,000,000	Prof. R. H. Thurston, Cornell University, Ithaca, N. Y., Jas. N. Warrington, C.E., Chicago, J. S. Coon, C.E., Burdett, N. Y.
Philadelphia, Pa.	20,000,000	125,022,000	J. E. Codman, C.E., Philadelphia, Pa.

The principal office of the Holly Manufacturing Co. is at Lockport, N. Y., and its officers are: Hon. T. T. Flagler, president; H. F. Gaskill, vice-president and engineer; H. H. Flagler, treasurer.

Branch offices:

C. G. Hildreth, secretary; office 45 Broadway, New York City.

P. H. Linneen, western agent; office 51 Home Insurance Building, La Salle Street, Chicago, Ill.

W. E. Decrow, eastern agent; office 27 Federal Street, Boston, Mass.

Spontaneous Combustion.

The frequent occurrence of fires from spontaneous combustion has led us to more frequently refer to the subject in these columns than we should, were it not important to everybody to be constantly on the watch to see that the causes for these more or less disastrous fires do not exist on their premises.

A late number of *Stove and Hardware* gives a list of fires which have recently occurred from this cause.

In a manufactory of plane bits in Chicago, a sponge had been used to transfer the water by capillary attraction from a water box to an emery wheel, on which the bits were ground. The sponge wiped off the fine steel particles from the wheel, and they were collected in the cells of the sponge, and kept constantly wet. The sponge was finally laid aside, and after a week or ten days it was discovered that the mass was spontaneously ignited, and if it had not been for its timely discovery another mysterious fire might have resulted.

In a factory in New Jersey where oiled stock for planes was operated on by boring, planing, and mortising machines, causing shavings and fine particles of wood, which were saturated with linseed oil, to collect on the floors, it was noticed that a great increase in the temperature took place when the sweepings—which had been moistened by sprinkling—were collected in a

pile. On a subsequent occasion it was found that a barrel of shavings and chips from the boring and mortising machines were so hot as to be almost ready to ignite. Another barrel contained shavings made in planing oiled stocks. On these being moistened with water they soon began to heat, and the temperature continued to rise until the next day, when it was found that the shavings began to char. The barrel was covered with a metal plate until the next day, when, on being disturbed, the mass burst into flames.

A number of bales of Sea Island cotton stored in a warehouse in New Jersey were found to be on fire. When the fire was extinguished at one spot it would start at another. The cotton had been ginned on a roller gin, which, in cracking a portion of the seed, had caused the oil in the seed to become mixed with the cotton, and the result was spontaneous ignition.

In the manufacture of a cement or putty composed of whiting and boiled linseed oil, which, after being ground in a mill, was put in barrels, a fire was discovered under one of the barrels standing on end. The floor was partially burned through when the discovery was made. In grinding the oil the mass became warm from the friction, and a small part of the oil had leaked through the common barrels while in this warm state. It was discovered in time to prevent much damage.

An engineer placed a bunch of waste—which had collected in cleaning up a mill—in front of a boiler, in

magnets for each other, each time that a card is placed with its magnet in the base, the figure will turn round this axis and effect a series of oscillations round its own axis until the poles of the U-shaped magnet holder under its robe are opposite the contrary poles of the straight rod hidden in the card. If the base has been correctly marked previously, the divining rod will indicate the corresponding number of the answer. Any boy with a little genius and a few tools can make an oracle similar to our engraving.

The Cannon Ball in Therapeutics.

It is a very self-evident proposition in physics that a cannon ball, as ordinarily propelled, will, upon its abdominal impact, produce a movement of the bowels. Such a movement, however, is attended with the serious personal inconvenience of producing a large hole in an important portion of the economy. And it is not in this way that Dr. H. Sahli, of Bern (*Correspondenz-Blatt für Schweizer Aerzte*), proposes to utilize the cannon ball in therapeutics. He advises that it be simply rolled about upon the abdomen for five or ten minutes daily, in order to relieve habitual constipation. The weight of the ball should be from three to five pounds. In cold weather it can be covered with chamois or kept warm by the stove. Better still, according to Dr. Sahli, is the plan of having the patient take it to bed with him at night, and thus

letting the missile of war warm itself ingloriously in the arms of the victim of colprostatitis. The best time to use the cannon ball is in the morning after waking. It is then to be made part of the morning toilet; the patient lying on his back in bed rolls his ferric bedfellow systematically over the abdomen. The direction is not of so much importance as that of systematically treating every part of the abdominal wall. Abdominal massage is acknowledged to be a useful measure in torpidity of the bowels, and Dr. Sahli assures his readers that by his method he has been able to cure nearly an of his cases without the aid of medication. Of course proper attention should be paid to diet and hygiene.

When universal peace

comes, the orator can speak not only of turning swords into plowshares, but also of cannon balls into aperients; while of Dr. Sahli it may be written: "Peace hath its victories, no less renowned than war."—*The Medical Record*.

Secure the Loose Joints.

The *Master Mechanic* thinks that engineers pay too little attention to the necessity of securely fastening the flexible parts in moving machinery that are liable to vibration. Such parts act like a cutting instrument, and eventually wear into each other and into the permanent structure. Not long since a locomotive could be seen, built by a builder of some reputation, where the cab sheet, not being fastened to the boiler, had cut about half way through the wagon top, almost rendering the boiler dangerous, and yet this locomotive had been built only a few years. The excessive noise about cars and locomotives renders the squeak and noise incident to such wearing unnoticeable. It therefore escapes attention until the damage is done. Often under new cars one can see loose rods bearing upon stay rods and trusses, without sufficient fastening to firmly hold them from

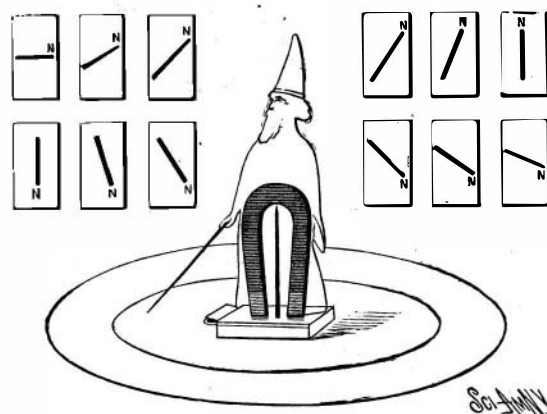


Fig. 2. DETAILS OF THE MAGNETIC ORACLE.



Fig. 1.—THE MAGNETIC ORACLE.

order that the fireman could use it the next morning in starting up the fire. During the night it spontaneously ignited, set fire to the kindlings which had been made ready for the morning, raised steam sufficient to blow off and alarm the watchman.

Some years since a gentleman was experimenting in coloring Southern moss for decorative purposes. In one of his experiments he used a very thin paint or varnish, but slightly colored with a pigment. He dipped the moss in the mixture, and then squeezed out as much as possible by hand. The result not proving satisfactory, he threw the moss in a box and placed it in a closet. A few days after, the odor of something burning led to the discovery that the moss was charred, and almost ready to ignite.

A SCIENTIFIC TOY.

The toy shown in the subjoined figure, taken from *La Nature*, although far from new, is nevertheless ingenious, and cleverly modernized by the constructor. This is the way to make the oracle speak; we will afterward give the secret of its accurate answers. We write upon 12 prepared cards a series of questions relating to history, geography, science, customs, etc. One of the company takes one of these cards at random and reads one of the questions; then the card is placed under the magician's feet, in a groove made to receive it. Immediately the oracle turns on its axis, and after some oscillations becomes fixed in a certain position, its magic wand pointing to one of the numbers by which it is surrounded. On referring to the corresponding number on a list, we read an admirably exact and accurate answer.

We may see that by varying at will the cards of questions and answers we may obtain from the oracle an indefinite number of replies. Nothing could be simpler than the process by which this result is obtained. The base of the toy, into which the cards slip, bears a vertical pivot on which rests the body of the magician, whose robe conceals a vertical U-shaped magnet, having its two poles near the base, as shown in Fig. 2.

In each of the cards there is another magnet concealed, a straight rod, occupying a different position for each of the 12 cards. We see that in virtue of the well known laws of the attraction of

vibration. If the louder noises and sounds about cars and locomotives could be silenced, the magnitude of the squeaking and grating sounds would be surprisingly apparent.