NEW GAS AND PETROLEUM MOTOR.

The problem of designing and perfecting a motor for small and medium powers, for universal use, is one that has received a great deal of attention from engineers and inventors; but many failures have been made in attempts to meet all the requirements of the case.

The principal difficulty has been, not so much in the production of a working machine, as in designing a motor which is at once efficient, economical, safe, and capable of being used anywhere and by any one, whether experienced in mechanics or not. A machine having these qualities is shown in the annexed engravings. It is a new gas and petroleum motor, the invention of Mr. Gottlieb Daimler, the eminent engineer, Cannstadt, near Stuttgart, Germany.

These motors are built in sizes varying from one to ten horse power, and in several modified forms to adapt them to various uses, the small industrial motors being designed for convenient connection with machines requiring only a small amount of power, say less than one horse power, such as cream separating machines, sewing machines, pumps, ventilating fans, watch maker's machinery, light wood-working machinery, and for the use of amateur mechanics.

The larger sizes of the industrial motor are suitable for driving dynamos, printing presses, elevators, grinding mills, etc.; while those adapted to boats and vehicles differ but little from those applied to other uses.

Although these motors are built with a view to durability, with all the parts proportioned to safely stand the working strain, they are by far the smallest and lightest motors of their class. They are designed to run at a high speed, and are arranged so that they can be started in less than a minute, and may be run independently of either gas or water mains. When operated by petroleum gas, they run with still greater economy than with ordinary illuminating gas.

These motors are preferably made vertical, to economize space and reduce friction. In our engravings, Fig. 1 is a vertical transverse section of a double cylinder engine; Fig. 2 is an exterior view of the same; Fig. 3 is a perspective view of a single cylinder engine; Fig. 4 is a similar view of a double cylinder engine; Fig. 5 is a vertical section taken on a plane at right angles to the plane of Fig. 1; Fig. 6 is a diagramatic view of the gas-producing apparatus; and Fig. 7 is a perspective view, showing the application of the motor to a boat.

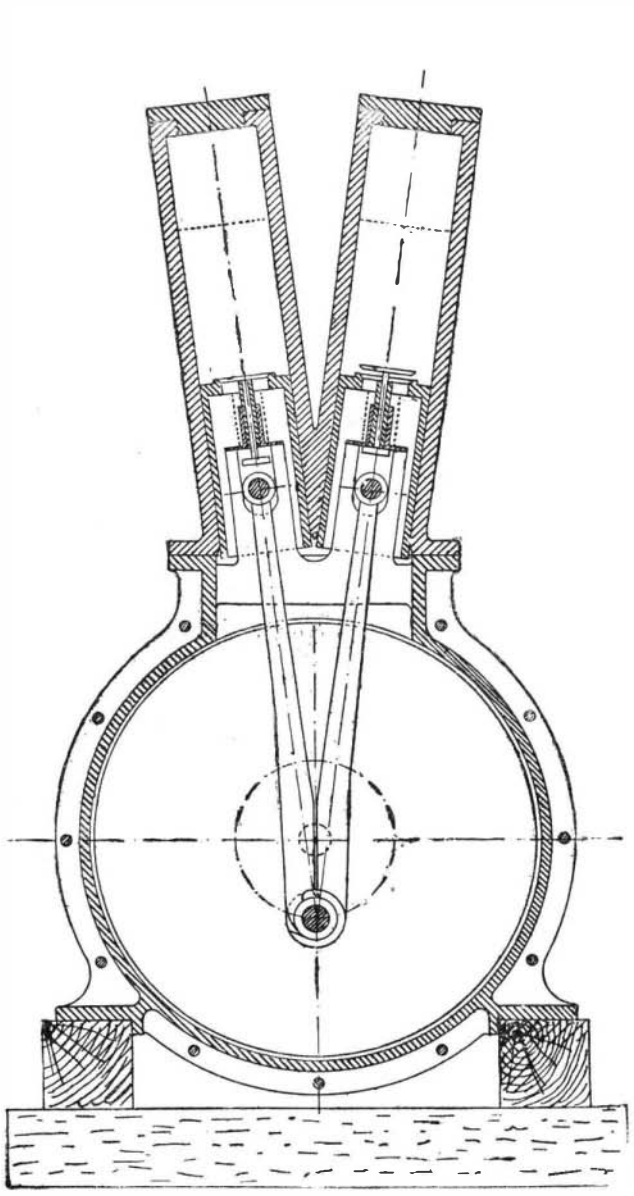


Fig. 1.—VERTICAL TRANSVERSE SECTION OF GAS AND PETROLEUM MOTOR.

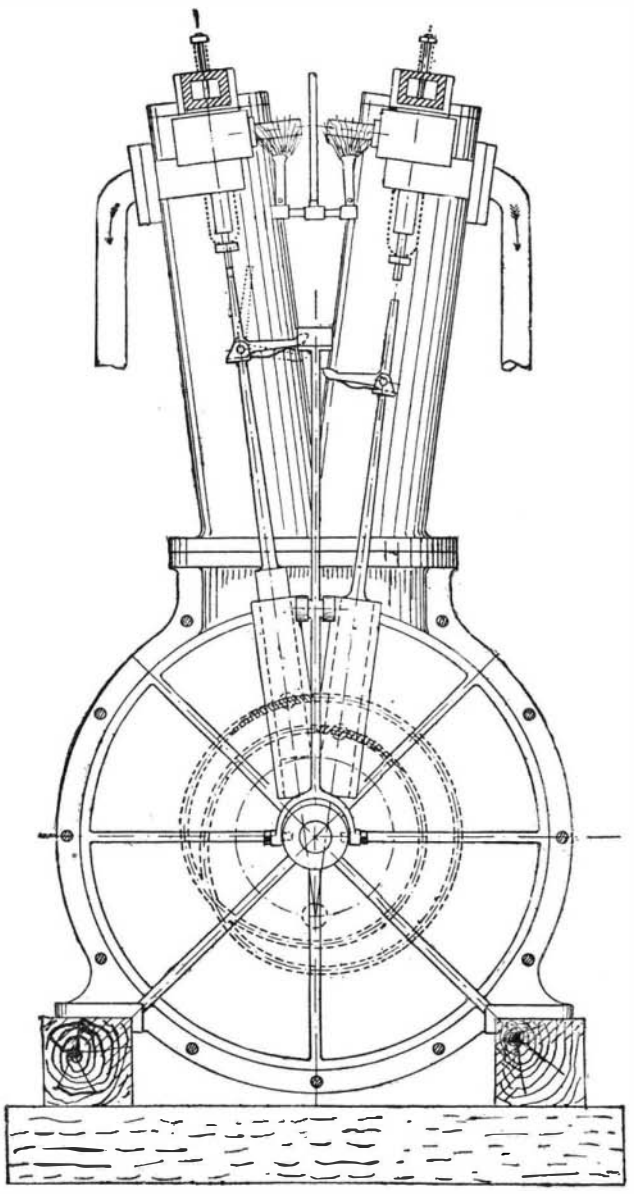


Fig. 2.—SIDE ELEVATION OF DOUBLE CYLINDER MOTOR.

The base of the motor consists of a cast iron gas-tight, circular chamber, with a valve inlet for combustible mixture or air. In the base are placed two disks, mounted upon the two sections of the main shaft and connected by a crank pin, the disks serving the double purpose of a crank and fly-wheels. In one of the disks is formed a double slip-cam groove, which passes twice around the crank shaft, and returns into itself. In this cam groove is placed a follower, which operates the valve gear so as to make every alternate stroke a working stroke.

Upon the base are mounted one or more working cylinders, according to the power required. When two cylinders are used, they are either arranged parallel with each other or joined at the base so as to spread out at the top, forming a slight angle, as shown in Figs. 1, 2, and 4. Each cylinder contains a piston furnished with a valve for the transfer of air or gaseous mixture from the base, the valve being provided with a fork by which it is operated. It will be observed by reference to Fig. 1 that both the connecting rods of both pistons in the double cylinder engine are received upon the same crank pin. The space in the upper end of the cylinder above the piston is the explosion chamber, with which are connected the inlet and exhaust valves. All the valves used in this engine are of the type known as poppet valves, these having been found in actual practice preferable to sliding or rotating valves. Every alternate stroke of the piston is a working stroke. During the upstroke of the piston, following the working stroke, a preliminary charge of air is drawn into the lower part of the working cylinder, from the crank chamber in the base, as the piston rises. At the same time, the upward movement of the piston forces the products of combustion from the explosion chamber through the exhaust valve, which is opened by the slip cam. During the following downstroke, the air in the cylinder below the piston is forced upwardly into the working part of the cylinder. At the same time a charge of combustible gas is admitted, and the following upstroke of the piston compresses the explosive mixture in the explosion chamber, forcing it out into the capsule, C, projecting from the inlet valve chest, and this capsule being heated by the burner, D, ignites the explosive mixture, the expansive power of which forces the piston downward. The ignition of the charge is retarded until the crank is on the dead center, by the introduction into the ignition tube of a charge of mixture weaker than that contained in the cylinder. The speed of the engine is controlled by a sensitive governor contained in the pulley, and arranged to intermit the admission of the combustible gas when the speed exceeds the normal. The movements of the piston, when no combustible mixture is introduced, resulting in simply compressing and recompressing the air contained by the cylinder.

By the order of operations adopted in this engine the power cylinder is emptied of most of the residual products of combustion and a purer charge of combustible mixture is used than possible with any other system. As a consequence the fuel, whether it be coal gas or petroleum vapor, is used to the best advantage and with the greatest economy.

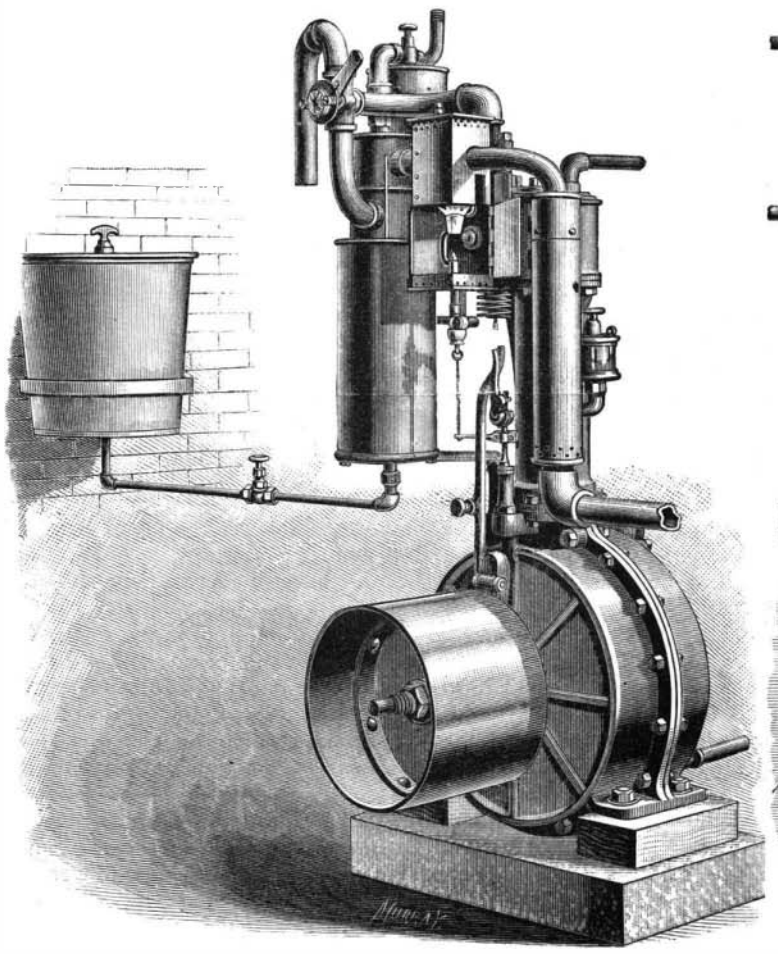


Fig. 3.—DAIMLER GAS AND PETROLEUM MOTOR.

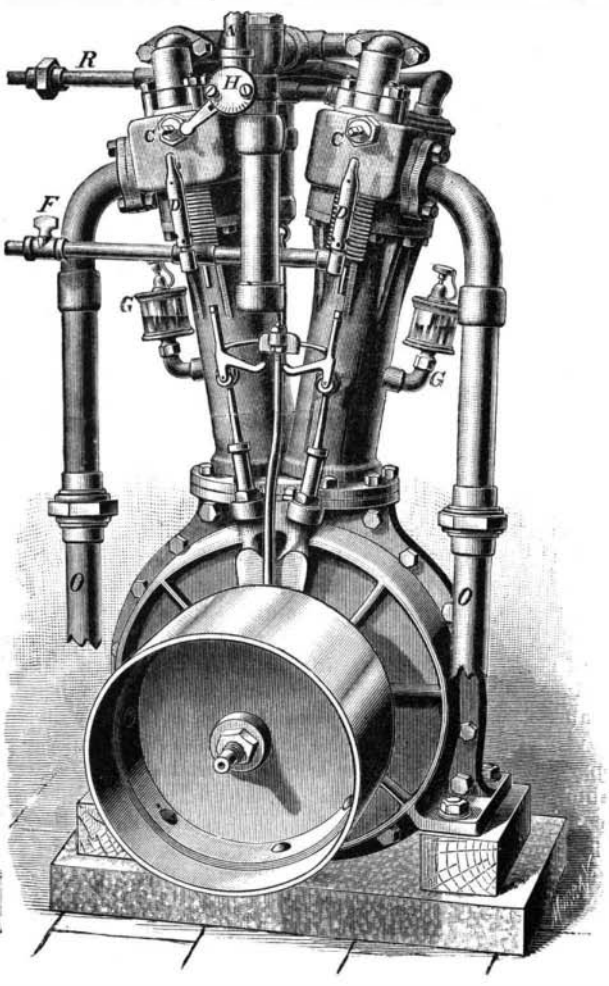


Fig. 4.—DOUBLE CYLINDER DAIMLER MOTOR.

The ingenious mechanism by which the necessary alternating motion of the valves is secured without the use of gearing is worthy of notice. In engines using gears for actuating the valves, the principal and most objectionable noise is the rumble and jarring of the gearing. In this engine there is no noticeable noise; in fact, it may safely be called a noiseless engine. The inclosure of the working parts in a casingcontributes largely to this result. This construction also insures a rigid base, which is an important item in a gas engine when the power is developed in the cylinder almost instantaneously. Besides this advantage, the chambered base secures in a very simple way the perfect lubrication of all the working parts, at the same time confining the oil so that it is economized to the fullest extent without being scattered about where it is not wanted.

The motor is lubricated by a single oil cup, G, connected with the lower part of the cylinder. The oil received in this manner falls toward the bottom of the casing, and is repeatedly thrown up by the revolving disks.

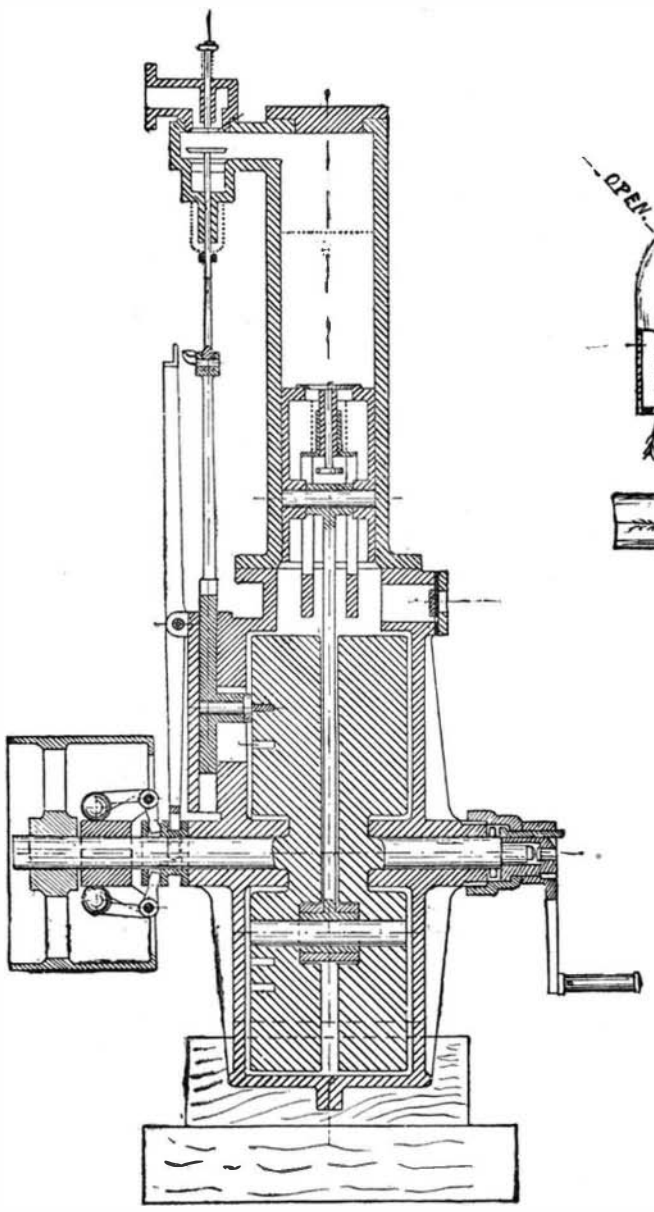


Fig. 5.—VERTICAL SECTION OF GAS MOTOR ON THE LINE OF THE SHAFT.

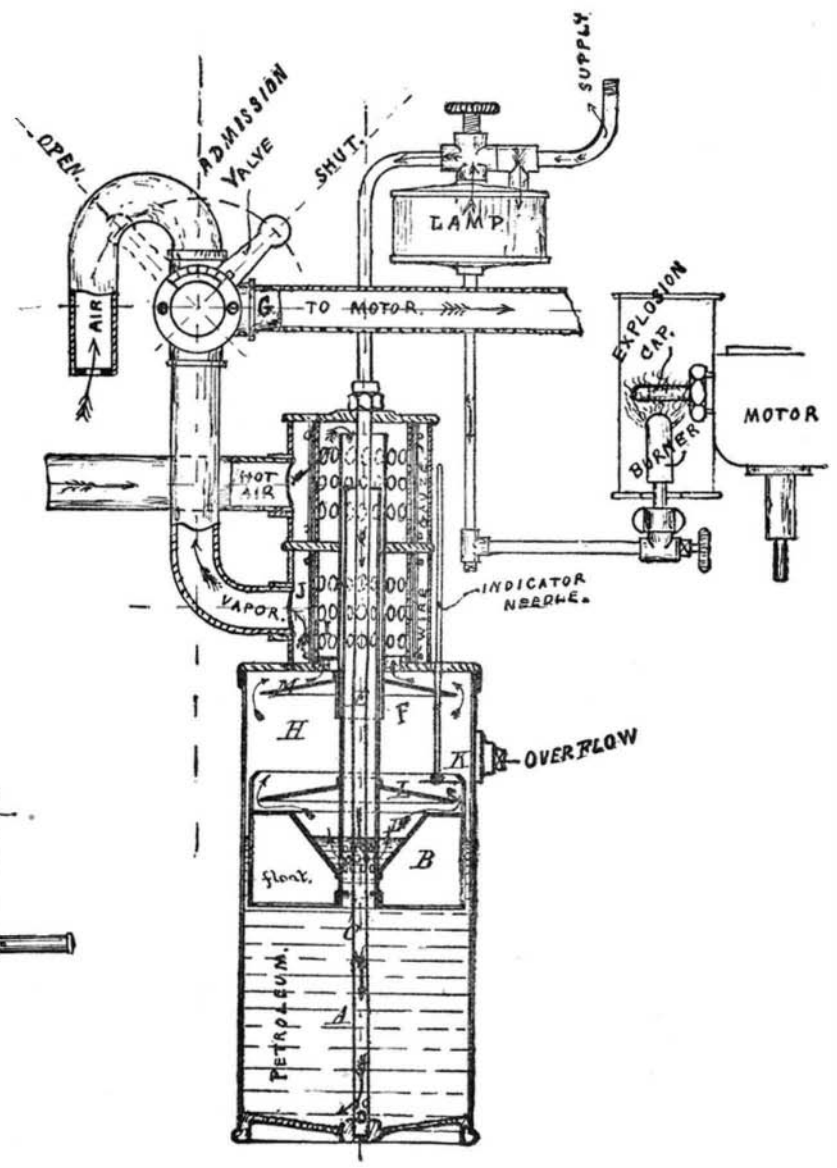


Fig. 6.—CARBURETING APPARATUS.

The explosion chamber is surrounded by a water jacket, and is kept at the proper temperature by a small quantity of water circulating through it, the water being taken from a tank and circulated by gravity in stationary engines, while in portable engines the circulation of the water is effected by means of a pulsometer worked by the exhaust.

By these simple means the necessary cooling of the cylinder is effected without any outlay for water in stationary engines, and without the consumption of any power in portable engines.

The motor is started by means of a crank handle on the main shaft, having a clutch which engages the shaft as the crank is turned in the act of starting the engine, and which automatically releases the handle as soon as the engine, after one or two turns, begins to run itself.

Where petroleum is used as fuel, the carbureter shown in Fig. 6 is employed. The lower part of the carbureting apparatus consists of a small petroleum tank, H, containing a float, B which rests upon the petroleum. The float is provided with a central funnel which communicates with the main body of the liquid in the tank through a small opening at the bottom, so that while the liquid is maintained at a constant level in the funnel, it is practically isolated from the main body of the petroleum. The float is provided with an air tube entering the funnel, and perforated below the surface of the petroleum. This air tube slides freely in a tube, F, attached to the cover of the apparatus and acting as a guide, allowing the float to rise and fall, according to the supply of petroleum. Hot air is admitted to the carbureter through the pipe attached to the upper part of the apparatus, the air being heated in its passage to the carbureter by the products of combustion, which pass through a jacket surrounding the air pipe, on their way to the open air. The carbureted air passes through the vapor pipe in the direction indicated by the arrow, and unites with a stream of air drawn into the motor cylinder through the admission valve, G. This valve is provided with a graduated scale, which facilitates the adjustment. It has also an automatically operating safety valve. The reservoir, H, is filled through a supply pipe extending down to the bottom through the air tubes and float. The supply pipe communicates with the lamp font, which furnishes the fuel to the burner which heats the ignition capsule.

The time required for heating the capsule and starting the motor is only a minute or so. The motor is stopped temporarily by shutting off the supply of combustible gas, allowing the ignition burner to continue burning, but for a complete stop the ignition burner is extinguished in addition to shutting off the gas.

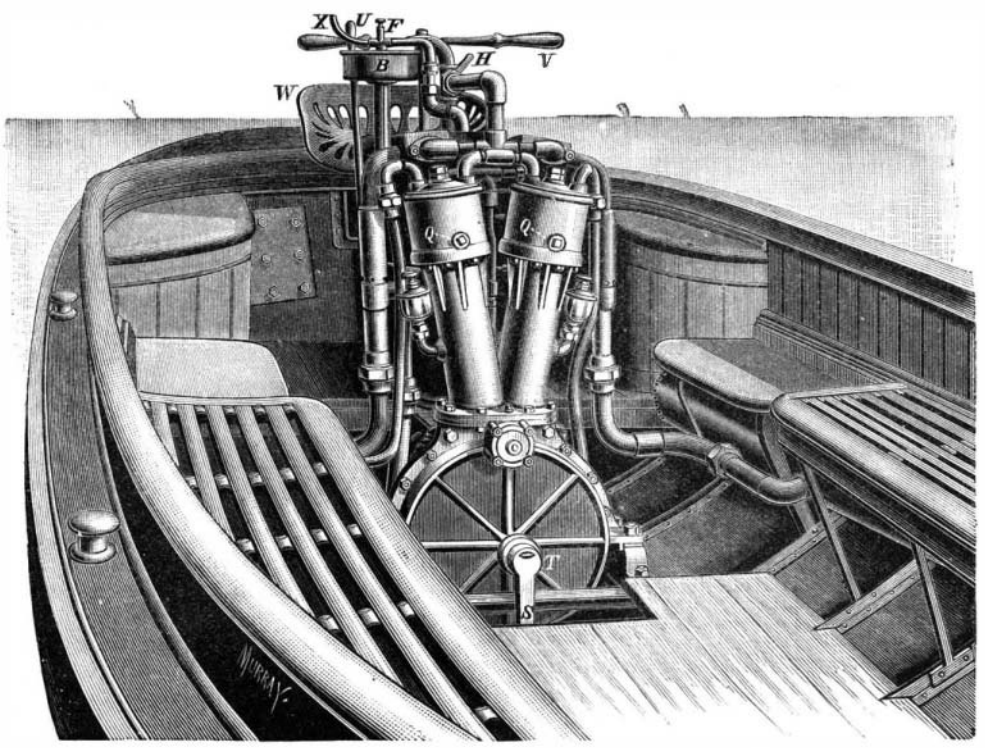


Fig. 7.—DAIMLER MOTOR APPLIED TO BOAT PROPULSION.

This motor is not only admirably adapted for all stationary purposes, but has been applied very successfully to the propulsion of small boats, to operating street cars and trolleys, and to road wagons and carriages. The smallest tramway in the world is operated in the streets of Cannstadt, Germany. The car is driven by a one horse power motor of this class. It will carry ten persons, and will run a mile in four minutes.

Boats driven by these motors are, during the season, in daily operation on Bowery Bay, north shore of Long Island City. Boats of the same class are running successfully on many of the lakes and rivers in Europe.

As this motor is readily supplied with fuel and is independent of water supply, it can be used in many places where a steam engine would be out of the question. It will undoubtedly be largely used for agricultural purposes, when it will find applications in thrashing, grain cleaning, wood sawing, feed cutting, churning, cider making, and in many other ways which will suggest themselves to our readers. It will also be welcomed by small manufacturers all over the country, who are in need of a motor of this kind. Many of these power users have been obliged to make use of animal, or even hand or foot power. Others have used small steam engines, which are proverbially troublesome. We imagine an engine of the class described will be gladly adopted by the small manufacturers who are remote from the great centers of business.

Another application of this motor will undoubtedly be to pumping water for irrigation, for filling house tanks, and for railroad water supply tanks.

It would be a difficult task to describe in detail the numerous uses to which an engine of this kind can be applied, but it is possible that for isolated electric lighting it may find greater use than in anything else to which power is applied.

This motor is manufactured by The Daimler Motor Company, Nos. 937 to 941 Steinway Ave., Steinway, Long Island City, N. Y., where motors from 1 to 10 horse power can be seen in actual operation. The New York office is at No. 111 East Fourteenth Street.

A MACHINE for making shoe strings out of paper is a recent Philadelphia invention.

Birds' Nests and Plants on Telegraph Lines.

It has frequently been found that birds, through their industrial instinct, are capable of offering impediments to telegraphic communications. The following are a few examples adduced by the *Revue des Sciences Naturelles Appliquées*. The American representative of our European woodpeckers, the green woodpecker of California (*Melanerpes formicivorus*) has now the habit of installing its dwelling and its innumerable storage places for food in the interior of the red cedar poles that support the wires of the lines of the western United States. A native of the mountains of Central America, this beautiful bird, of a dark green above and with a throat encircled with white, long ago spread throughout the western region of the United States without ever going beyond the territory of Arizona toward the east. Col. Clowry, an officer of the Western Union Telegraph Company, in a tour of inspection made by him in the far West, found that the summits of a large number of poles were deeply pierced by *Melanerpes* that had chosen a domicile therein. Performing its labor upon a height of about six feet, each couple of these birds forms two principal cavities, one above the other, with a space of about twenty-four inches between them, penetrating to the heart of the pole and communicating with the exterior by orifices of about three inches in diameter. The male, which occupies the upper cavity, keeps watch through small windows looking in different directions. The female and her brood occupy the lower story, which is of larger dimensions on account of the number of the inhabitants. Other holes of variable dimensions, widening toward the interior, are formed in vertical or oblique lines all around the top of the pole. These are the store houses in which the family of woodpeckers keeps various kinds of seed in reserve, the capacity of the cavity being proportioned to the bulk of the provisions that it is to contain. These holes, whose orifices measure about an inch or so in diameter, exist to the number of more than seven hundred upon each pole attacked, and it may be readily conceived to how great an extent they must reduce its duration, which usually reaches fifteen or eighteen years. The store houses are higher than wide, but their aperture, on the contrary, is wider than high, the object of this arrangement doubtless being to prevent the falling out of the seeds that they contain. This peculiarity of the *Melanerpes* (which are insectivorous birds) of accumulating seeds in the trunks of trees has long been known in America. So De Saussure, Sumichrast and several other authors had, by reason of this fact, considered them as granivorous. According to Clowry, the seeds are not eaten by the woodpeckers, but contain small larvæ upon which these birds feed.

A bird belonging to the family *Ploceineæ*, of the widow birds, forming large colonies in the south of Africa, at Natal, formerly saw its nests ravaged by snakes, which ate its eggs and young. The industrious bird had already displayed a certain architectural knowledge in the construction of its elegant nests, suspended from the branches of trees near dwellings. In making a new application against its dreaded enemy, it modified the plan of its aerial dwelling, the sole opening of which it formed in the bottom, directed toward the ground. The depredations of the snakes, which could no longer enter so easily, diminished without, however, ceasing. Seeing the number of tufted trees diminishing in the region, the birds began to suspend their nests from the telegraph poles; but, as the snakes found it difficult to ascend these perfectly smooth columns, the birds resumed their primitive plan and formed the opening at the side in order to have more easy access to it.

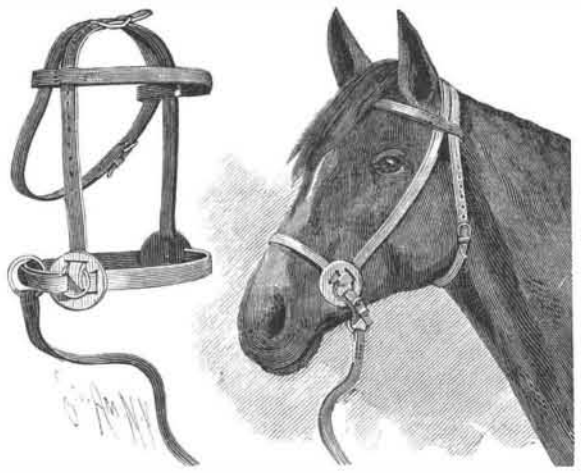
We now come to a new source of trouble in telegraphic communications, brought about this time by representatives of the vegetable kingdom. The telegraph wires radiating around Rio Janeiro are covered, it appears, with huge tufts of orchids hanging in festoons and garlands, and of a very pretty appearance without doubt, but which, by diverting the currents, cause frequent interruptions in the transmission of telegrams. The wind plays no part in this transplantation, which has birds alone for agents. These latter, being very fond of the capsules of the orchids, eat them in the forests, and the seeds, deposited upon the wires with their excrement, soon germinate and then vegetate in the most luxuriant manner.—*Revue Scientifique.*

The British Shipping Trade.

Many steamers have been laid up in northern ports. Other vessels are on their way home to lie idle, and it seems certain now that the winter will be a dull one in the shipping trade. All the reports from abroad speak of little demand and unpromising and unprofitable rates. The only vessels that seem to be doing any good at all are the newest and largest class of steamers supplied with the latest improvements of triple expansion engines. These are enabled to take large cargoes and make quick voyages as a rule, and as they are said to save about 15 per cent in the cost of fuel, there is no wonder that they can be kept working while others are altogether unemployed.

AN IMPROVED HALTER.

The illustration represents a strong, simple, and inexpensive halter. the size of which may be readily changed to fit it to the heads of different sized animals. It has been patented by Mr. L. E. Shippy, of Sandy Hill, N. Y. The check straps and nose strap of the halter are made of a single strip of leather, by means of a sliding engagement of such strip with two similar cheek guards, preferably made of stout leather, cut in disk form, and each having two slits, at nearly right angles to each other. The cheek strap passes down through one slit and out through the other slit to form the nose strap, a ring being placed on the strap at the fold thus made on the outer side of the cheek guard.

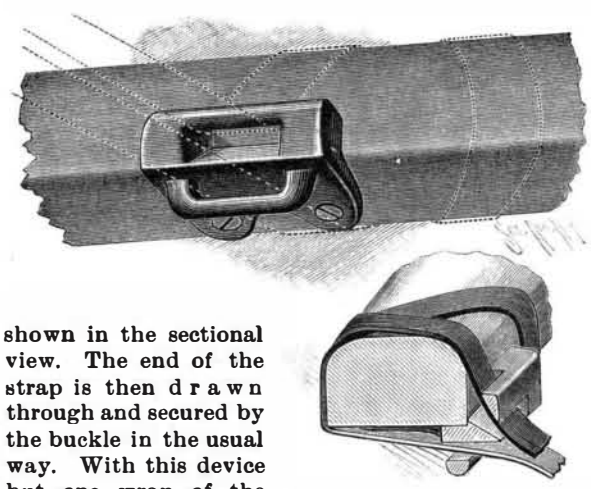


SHIPPY'S HALTER.

The nose strap passes in a similar manner through the cheek guard on the other side, and the two ends of the strap are united by a buckle at the top, whereby the two cheek straps and the nose strap may be lengthened or shortened as desired. Through the rings at the side of each cheek guard is inserted a curb strap, passing under the animal's mouth, and adjustable by means of a buckle, to draw the nose strap and cheek straps to proper position, the leading or hitching strap being attached to a ring placed on the curb strap. The end portions of the brow band of this halter loosely engage the cheek straps and the throat latch strap, such portions being folded and stitched to form elongated loops through which the straps slide.

A HOLDBACK DEVICE FOR VEHICLES.

The accompanying illustration represents a device whereby the holdback strap may be readily and firmly secured to the thill, and a "sulky hitch" accomplished with less length of strap than is usually required. It has been patented by Mr. Isaac H. J. Ellsworth, of Jackson, Mich. The device is preferably made of cast iron, and is secured to the under face of the thill by means of screws. The strap being secured to the breeching, its eyeleted end is passed through a slot in the bridge of the device, as shown in the perspective view, brought over and wound round the thill, and then passed downward through a slanting slot, the beveled face of which turns the end of the strap out, as



ELLSWORTH'S HOLDBACK.

shown in the sectional view. The end of the strap is then drawn through and secured by the buckle in the usual way. With this device but one wrap of the strap around the thill is required, and a neat, rapid, and substantial hitch is thus effected. For further information relative to this invention address the patentee, or Mr. L. C. Butler, West Bay City, Mich.

Growth of European Cities.

The census which has just been completed in Germany shows that the growth of cities is almost as rapid in Europe as in this country, and, in some respects, even more wonderful. Berlin has gone up past New York, with a population of 1,574,485. Hamburg, with its big suburb of Altona, has 715,170 inhabitants. Leipsic is credited with 353,272. Munich has a population of 344,899, and that of Breslau is 334,710. Cologne has 282,537 inhabitants; Dresden, 276,085; Magdeburg, 200,071; and Frankfort-on-the-Main, 179,850. In 1885, when the last previous census of Germany was taken, Berlin had 1,315,297 inhabitants; Hamburg and Altona, 410,404; Leipsic, 170,076; Munich, 261,981; Breslau, 299,405; Cologne, 161,266; Dresden, 245,515; Magdeburg, 114,298; and Frankfort-on-the-Main, 154,513. Such gains as are here shown can scarcely be matched by an equal number of American cities. The period between the two enumerations, it must be remembered, is only half as long as that from 1880 to 1890, which is used in all tables showing the growth of American cities, and yet while there are but four places in this country in which the increase in population has been as much as 120,000 in the last ten years, Germany has four cities which have increased from 121,000 to 259,000 each in five years. It is the same with some of the smaller cities. Magdeburg has gained about as much in five years as Detroit or Milwaukee in ten, and Munich is growing much faster than Cincinnati or San Francisco. The crowding into the towns which has caused so much comment in this country is found everywhere in the civilized world. Next year the census to be taken in Great Britain will show that not a few British cities have been gaining at an astonishing rate for old towns in a country where the population has long been dense. Even in ancient India the growth of the cities is out of all proportion to that of the country as a whole.—*Cleveland Leader.*

Phosphorescent Centipedes.

That there are luminous Myriopods has been known for many years, as also the fact that they occur only among the family *Geophilidæ* of the Chilopod Myriopoda. Both sexes are luminous, sometimes quite intensely so, and the luminosity spreads out over the whole ventral surface of the animal. If one of these Geophilids is taken up, the luminous matter communicates to the hand of the observer or to anything else with which the specimen comes into contact.

There is considerable dispute regarding the origin of this phosphorescent matter. According to Dr. R. Dubois, it is contained in the epithelial cell of the digestive tube, and the emission of the light depends on the moulting of the digestive tube. Mr. Macé, on the contrary, contends that the luminons matter is a glandular excretion, and that these glands (*glandes preanales*) are situated on the last two segments of the animal. Mr. J. Gazagnaire has satisfied himself that the luminous matter is secreted from glands situated on the sternal and episternal plates. Upon pressure these glands secrete a yellowish, viscous substance, having a peculiar odor and which is highly phosphorescent.

In a more recent article (*Mem. de la Soc. Zool. de France*, v. iii, 1890), Mr. Gazagnaire reviews all previous observations on luminous Geophilids, and finds that, so far as the European fauna is concerned, luminous specimens were found only between the end of September and beginning of November. The luminosity appears, therefore, only at a certain epoch in the life history of these Myriopods. Further, in all more carefully recorded cases, luminous specimens were never found singly, but always in pairs or in companies of three or more specimens. The few and fragmentary observations that have hitherto been made on the mode of reproduction in these animals seem to prove that the fecundation of the female takes place in autumn, or just at the time when the luminous specimens are found, and Mr. Gazagnaire is thus fully justified in connecting the appearance of luminosity with the excitement caused by sexual instinct.

In Algiers, Mr. Gazagnaire observed luminous specimens of *Orya barbarica* in the month of April, and he concludes that in other countries and in consequence of altered climatic conditions the period of luminosity probably differs from that observed in Europe.—*Insect Life.*

The Teredo.

The teredo is a nuisance and expense here, but the great Northwest coast, which tries in many ways to prove its superiority over California, in one respect at least carries off the palm, and that is in teredos. Captain Gibson, of the bark J. D. Peters, has presented this office with the section of a pile which was in a raft waiting to be used in the building of a wharf at Seattle. The pile had been in the water only thirty days, and when hauled out on the beach it was noticed the teredo had got in his deadly work, and the stick was, before it had ever been used, rendered worthless by this pest. The section referred to is about a foot in diameter, and contains by actual count 212 holes bored by this industrious wood worker. When the log was on the beach, it is said the little pests keep up boring, so that placing the ear near the pile, it sounded as if a sawmill was in active operation. With such an illustration of the futility of using wood for wharves, why is it that here and at the North some plan is not devised by city or State authorities to make permanent improvements on the water front of each city? Docks built of stone, though the first cost is greater, would in a very short time be cheaper than wooden wharves constantly needing renewal, and this section of a pile, which is on exhibition in this office, is an object lesson which merchants, tax payers, and particularly officials having charge of the wharves in this and other Pacific coast cities should study.—*Commercial News, Cal.*