IMPROVED VERTICAL GAS ENGINE.

We illustrate a new gas engine which is being manufactured by Messrs. Louis Simon and Sons, of Nottingham, England, and is known as the Humboldt and Gilles' vertical gas engine. The illustrations, Figs. 1 and 2, show an elevation and section of the engine, and Fig. 3 gives the valves and parts of the piston in detail. The cylinder is fitted with the working piston, H, and the upper piston, D, the former being connected by a connecting rod to the crank, K, on the fly wheel shaft below; on this shaft is the cam, O, which works the gas slide, D^1, and also a cam which releases the clamp of the upper piston rod. The slide, D^1, has in it a cavity, *p*, and a sloped passage, *y*, and the slide jacket has ports, b^1 and c^1, for the admission of gas and air; *i* is a burner for admitting the kindling flame to the passage, *y*, which communicates also with an air port, *h*. The passage, *a*, into the cylinder in one position of the slide admits the mixture of air and gas supplied to the cavity, *p*, and during the rapid movement of the slide admits the kindling flame which ignites the mixture in the cylinder; a smaller passage is placed below the passage, *a*, so that when the latter is stopped by the loose piston head, *d*, the products of combustion still inclosed between the two pistons can only escape very slowly owing to the screw, F, it thus acting as an air buffer, preventing concussion of the two pistons. The passage, *a*, governed by the valve, *b*, permits the products of combustion to issue from the cylinder, the valve, *b*, closing to prevent ingress to the cylinder. In connection with the gas valve is a regulating pump, which is worked by the cam, O. The piston or sucker draws in and expels at each revolution a small amount of liquid. If the revolutions follow one after the other in too rapid succession, all the liquid cannot be expelled; this causes the lever attached to lift and hold stationary the bar, H^1, thus preventing a new charge of gas being given until the speed has diminished. The apparatus for clamping the rod of the upper piston, and preventing it from descending till the grip is relieved, consists of four levers, K, Fig. 1, pressed down by springs. The ends of the four levers, K K, Fig. 1, are rounded, and enter notches in a pair of clamps, N, which consist of a bush made in halves inclosing the piston rod. The levers, K K, are a little inclined upwards, so that, as they tend to come down to a horizontal position, they press the sides of the clamp, N, firmly against the piston rod, and grip it, thereby preventing it from descending until the eccentric, O^1, connected to the lever, *m*, top of Fig. 2, is brought round to such a point in its revolution as to raise the inner end of the lever, *m*, pushing upwards the clamp, N, and so relieving the piston rod and allowing the piston, D, to descend.

The operation of this engine is as follows: Assuming that the working piston is at the extremity of its stroke inwards, the loose piston being close to it, the former by t rotation of the crank is drawn outwards; and the loose piston, having on its opposite side the pressure of the air entering by the top, follows the working piston till it is stopped by the collar on its rod meeting the buffers provided on the cylinder cover. The working piston, continuing its movement, creates a partial vacuum behind it in the space between it and the loose piston. The cam having moved the gas slide so as to admit into this space the mixture of air and gas, admits the kindling flame whereby the mixture is exploded. The pressure produced by the explosion drives forward the working piston, and at the same time causes the loose piston to make a rapid stroke in the opposite direction, the air in the space beyond it being discharged through the space in the top cylinder cover. When the projecting upper head of the loose piston closes this space, the remaining air slowly escaping by a spring valve serves as a cushion to arrest its movement. The working piston having made its outward stroke, and the loose piston having also made its outward stroke, and the gas slide having closed, the space in the cylinder between the two pistons remains charged with the products of combustion at a pressure considerably below that of the atmosphere. The atmospheric pressure, therefore, tends to force both pistons inwards. The working piston moves inwards in obedience to this pressure, but the loose piston is held near the extremity of its outward stroke by the friction cheeks.

When the working piston is approaching the extremity of its inward stroke, the friction cheeks are slackened off the rod of the loose piston by the action of the eccentric, and the air slide is opened. The loose piston thereupon makes a rapid stroke inwards till it nearly meets the working piston, and the products of combustion, thus compressed between the two pistons, are forced out by the discharge valve on the side of the cylinder. The action is then repeated. From the above it will be seen that the engine is double-acting, a portion of the outward stroke of the working piston being effected by the pressure of the explosion, and the whole of its inward stroke by the excess of the atmospheric pressure over that of the products of combustion. The cylinder being open at both ends, no water is required to cool it; and the application of the principle of using gas explosion principally to produce a vacuum has produced what promises to be a successful engine.

Fig. 3.

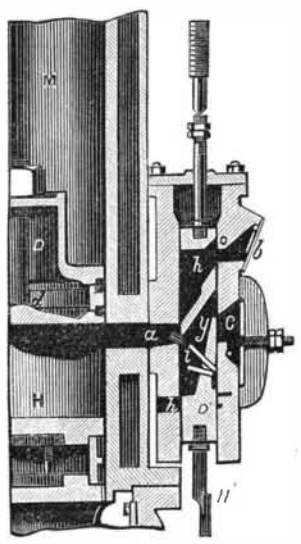


Fig. 1.

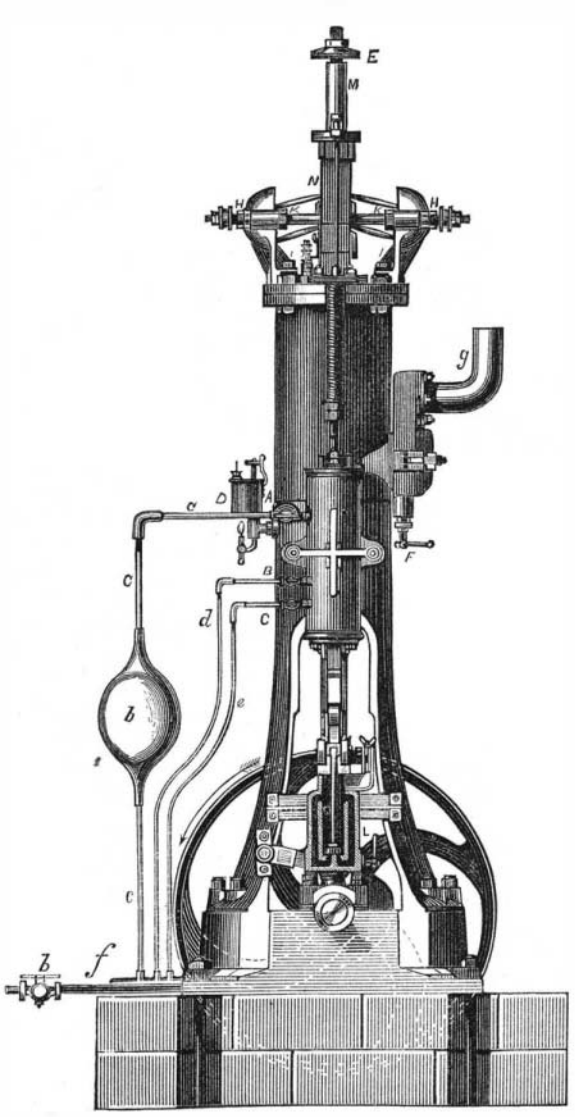
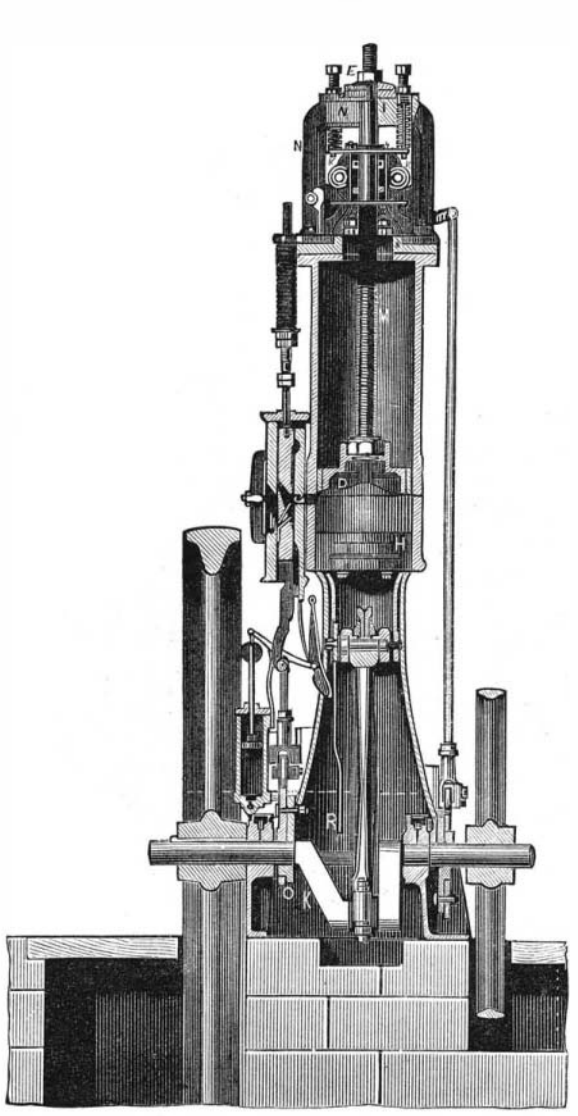


Fig. 2.



HUMBOLDT & GILLES'S VERTICAL GAS ENGINE.

The Triple Conjunction of Mars and Jupiter.

The present year is distinguished by the triple conjunction and long-continued proximity of these two planets, which, though it may not afford any very striking spectacle, possesses considerable interest for those who follow the motions of the planets in the heavens. Both planets were in conjunction on July 27, Mars in its forward motion passing Saturn in right ascension. Mars afterwards reversed its apparent motion, and repassed, in its retrograde course, Saturn on August 15, and will, on November 3, pass a third time, and this time close to Saturn. There has been no triple conjunction between the two planets since 1779, and the next one will not occur till the year 1946. In the course of six centuries, from the year 1400 to 2000, ten such triple conjunctions may be counted, including that of the present year, which, though triple in right ascension, is not triple in longitude. During the same six centuries the number of triple conjunctions between Mars and Jupiter is six and between Jupiter and Saturn three, the latter occurring in 1425, 1682–83, and 1840.

Mixed Animal and Vegetable Fibrous Fabrics.

It has hitherto been the custom in manufacturing fabrics composed of wool and cotton or other vegetable fiber, either to card both raw materials separately, in order to subsequently mix them up and spin the two into yarn known as merino or angola, or to mix up the animal and vegetable fibers before carding. However, the spinnings so prepared share the common defect of showing a quantity of small knots or irregularities on their surfaces, so deteriorating the quality of the yarn very much. By a newly patented process, the cotton and wool, or other vegetable and animal fiber, are each carded separately in a carding-engine best suited to the particular fiber in question. These cotton and wool cardings are then laid one on the other, and so passed through another carding-engine, which thoroughly mixes up the two fibers together, when they are spun into yarn in the usual manner.

The carding-engine used for mixing up the two fibers together must be set, to prevent the fibers entering the card teeth further than is necessary to ensure their parallel laying. The yarns prepared after this manner are quite free from knots, and of a better quality than heretofore obtained.

A Worm Farm at Nottingham, England.

When at Nottingham a few days ago, I was much pleased at the discovery of an entirely new industry, namely, the rearing and education of worms for the purposes of anglers. Mr. Wells, fishing-tackle maker, of Sussex street, Nottingham, carries on a business and trade in worms. He has several people in his employ who collect worms every favorable night during the year. He sells the following kinds of worms, namely, the lob or dew worm, the cockspur, and the ring-tailed brandling. In dry weather worms are very scarce; the men have to water the ground for them. In wet weather the worms are better and heavier. They are caught in the meadows and pasture lands in the neighborhood; the supply is not failing.

The worms are sold by the thousand or the quart. In a warm, moist night from two to six thousand worms are brought in by the collectors. Some people can collect worms much better than others. The worms are very cunning, and are apt to pop back into their holes if the person treads heavily.

When the worms are brought in, Mr. Wells at once begins his training operations by placing them in properly selected moss. Stag's horn moss will not do at all, it is too harsh. Grass is bad. Field moss is the best. The worms are put into the moss to scour. A fresh-caught worm is very delicate and tender, and easily breaks up when put on the hook. When a worm is properly educated he is as tough as a bit of india rubber, and behaves as a worm should when put on a hook. The way to test a worm is to take him up and pass the finger gently down the length of him. If anything comes out of him he is not fit, and is put back for further training. The meaning of this is that the wild worms contain, more or less, food undergoing digestion. When put into the moss this food disappears. The moss in some way facilitates this operation, but I cannot quite see how this is, unless the worms disgorge all their former food, and practically become very little else than skin.

The keeping of worms depends very much upon the weather. They will not keep well above a week. Mr. Wells has a supply of worms ready for his customers all the year round. He goes over his moss very frequently, picking out the mauled and mashed worms, and only sending to market the plump and healthy ones, which are packed up for market in moss; the bags used are of light canvas.

Not only does Mr. Wells collect worms, but he also breeds them in considerable quantities. In his garden is a special heap made of vegetable matter, expressly for the purpose of breeding worms. I shall not, of course, say what substance for worm-breeding is most favorable: this is a professional secret. On turning the heap over where the worms are bred, it was very interesting to see the worms in various stages of growth. Mr. Wells knows from experience pretty well what the age of a worm is. I had the pleasure of pointing out to him the eggs of the worm. These are about three lines long, and somewhat oval. They had a sort of lid at each end, which opens when the young are liberated. I believe that two young are sometimes produced from the same egg.

The business of worm selling has been going on some ten years and is gradually increasing.—*Frank Buckland, in Land and Water.*