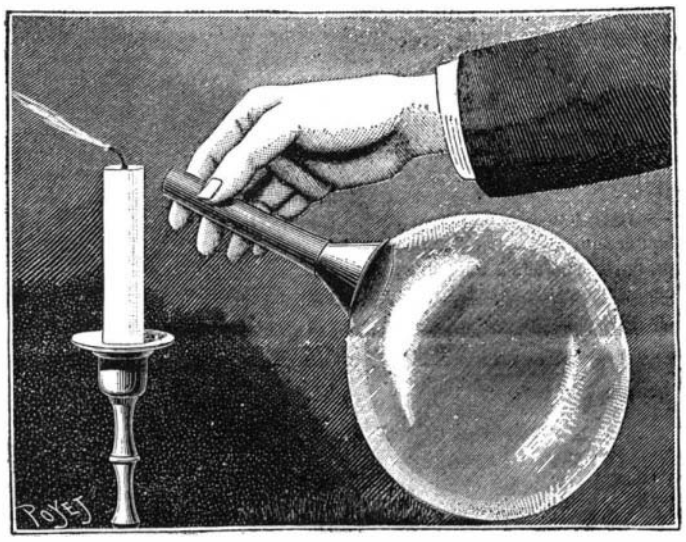
EXPERIMENTS WITH SOAP BUBBLES.

The air confined in a soap bubble is often submitted to pressure which, let us say in passing, is proportional to the bubble's curve, that is to say, inversely proportional to its radius, when it is spherical. Such pressure has been frequently measured, but its exact determination requires apparatus and a certain amount of skill. In return, it is very easy to demonstrate its existence and render it visible to an assemblage. To this effect, it suffices to blow a bubble upon a small funnel having a wide neck, like the mouthpiece of a cornet-a-piston, and then to direct the current of air issuing from the orifice against the flame of a candle. The flame will then take a horizontal position and may even be extinguished at the moment at which the bubble, before entering wholly into the funnel, exerts its maximum pressure. The annexed figure, reproduced from a photograph kindly sent us by Mr. C. V. Boys, member of the Royal Society of London, shows the arrangement of the experiment.

We shall describe another, which also is due to Mr. Boys. The phenomena of the diffusion of gases through membranes are rarely demonstrated in elementary lecture courses, although it can be done very simply. Pour into a bell glass, whose mouth is directed upward, a few drops of ether. These will volatilize and fill the bell with a heavy vapor. We can, in the first place, render the existence of this vapor evident by allowing a soap bubble to descend into the bell glass. The bubble will stop and float at a certain level. Then, after having bursted the bubble, let another be blown and plunged into the vapor. On taking this out after about half a minute, it will be remarked that it has lost its graceful form and hangs placidly beneath the funnel. If, now, a candle be placed near the latter's neck, a flame several centimeters in length will be observed to burst forth and burn as long as it is fed by the mixture of air and ether contained in the bubble. In preparing for this experiment, the bottle of ether must be immediately recorked, and only the quantity of liquid necessary to produce the effect required should be poured out. The candle should be at a level higher than that of the rim of the beli glass. Were these precautions neglected, there might an explosion occur that would offer a certain amount of danger.—*La Nature.*



EXPERIMENT ON THE INTERNAL PRESSURE OF SOAP BUBBLES.

A SIXTY HORSE POWER GAS ENGINE.

We give an illustration of]a 60 horse power nominal Otto gas engine designed and made by Messrs. Crossley Brothers, Limited, Manchester. This, says *Engineering*, is one of the largest gas engines yet constructed. Even when the success of the Otto gas engine of sizes up to 20 indicated horse power had been insured a few years ago, the makers themselves would scarcely have ventured to predict that in the short time that has since elapsed engines indicating 85 horse power with a single cylinder would be commercially successful, and supplanting fairly good steam engines, even when using ordinary gas. The engine illustrated is what the makers call a "twin 30 horse power" or 60 horse power nominal, and indicates 170 horse power with ordinary town's gas and 160 horse power with Dowson gas. The consumption with ordinary coal gas is, we are informed, as low as 16 cubic feet per indicated horse power per hour, and with Dowson gas the consumption of fuel is only 1 pound of anthracite per indicated horse power per hour. These engines are substantially built, with ample strength and large bearing surfaces, and are the result of over twenty years' experience by the makers in gas engine construction. The general design is very compact and simple, and the engine occupies a very small space when compared with that required for a steam engine of equal power, with its boilers, flues, and chimney shaft.

The ignition of the gaseous mixture inside the cylinder is effected by a glowing tube, the tube being made of a metal which can be depended upon to last over twelve months. A timing valve is used to insure the igniting of the mixture exactly at the right moment, and at the same time to avoid the risk of the engine reversing and turning the wrong way in starting. These large "twin" engines are started in a very simple manner, by a small auxiliary gas engine placed alongside.

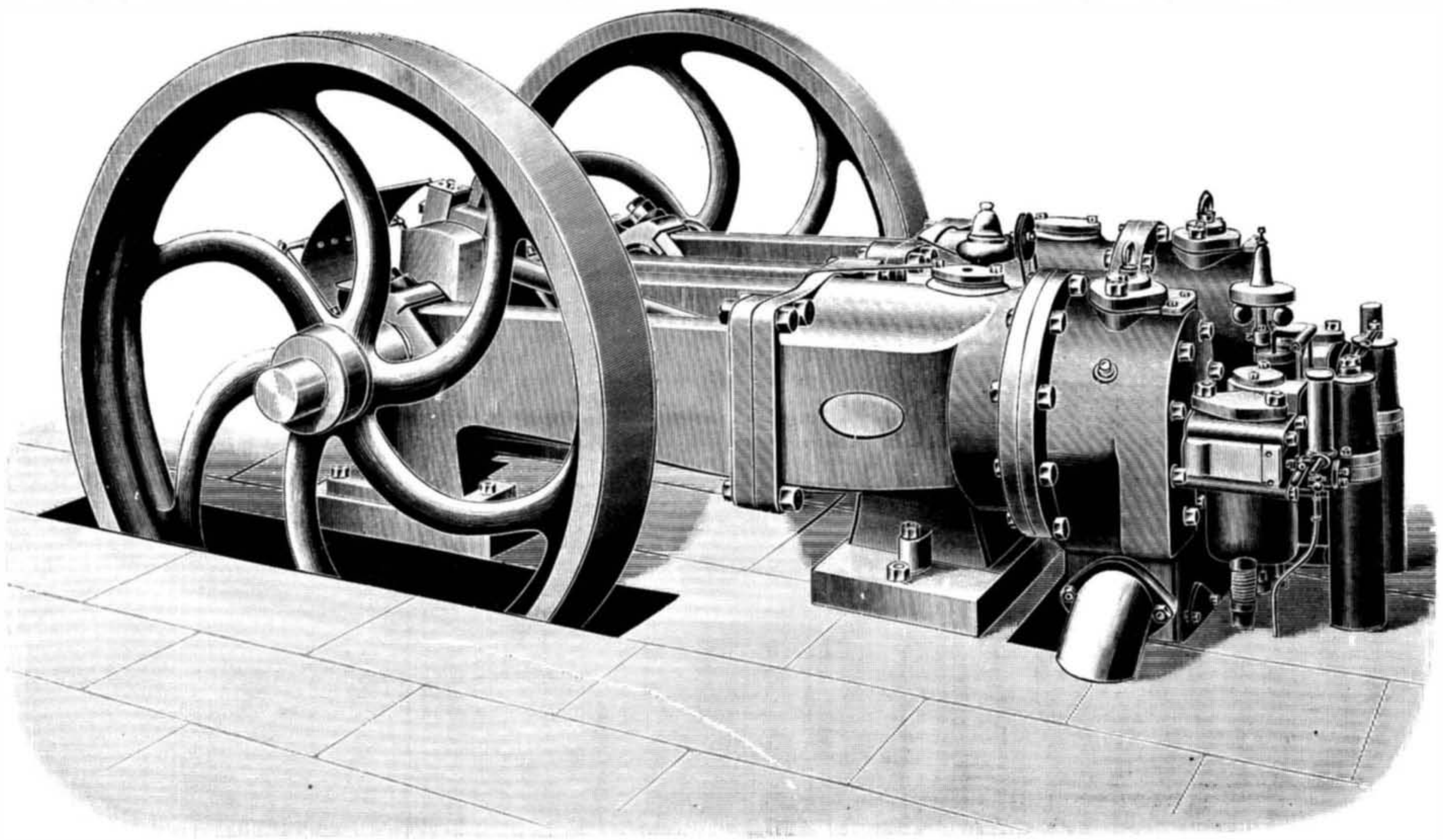
Color in Plant Life.

Those familiar with the growth of flowers know how essential light is to the creation of color. The most gaudy blooms and the most brilliant foliage if kept in the dark or overshaded will become pale and almost white. This fact (according to the *Horticultural Times*) shows the presence in the plant of some chemical agent which is acted upon by the actinic rays. To some extent this chemistry of nature is understood by florists, who, by the use of chemical manures and other means, strive to take the greatest advantage of it. For instance, it is a common practice to mix alum and iron filings with the soil in which certain plants are grown in order to bring out special colors. The bluish-tinted hydrangea is the result of such treatment. Salts of iron, or sodium phosphate, added to the soil turns the crimson of the peony to violet and produces blue hortensias. According to Dr. Hansen, who has studied the subject very closely for many years, there are only three distinct pigments to be found in flowers—setting aside the chlorophyl, which forms the green coloring matter in all plants. These colors are yellows, reds, and blues. The yellows are mostly in combination with the plasmic sap, while the others exist chiefly in solution in the cell sap. The yellow pigment forms an insoluble compound with fatty matters, and is termed lipochrome. Orange is formed by a denser deposit of the yellow, and the color in the rind of an orange is identical with that found in many flowers. The red in flowers is a single pigment soluble in water, and decolorized by alcohol, but capable of being restored by the addition of acids. Lipochrome combined with this red pigment produces the scarlets and reds of poppies and of the hips of hawthorns, but the varying intensity of reds in roses, carnations, peonies and other flowers depends on the presence of a greater or lesser quantity of acids. The blue and violet colors are also decolorized by alcohol, but reddened by acids. Florists have already succeeded in producing a very large scale of unusual colors in flowers, and there seems to be very good grounds for believing that it is possible so to manipulate nature that she will produce blossoms of every conceivable tint and hue.

A Complicated Instrument.

The beak of the mosquito is simply a tool box, wherein the mosquito keeps six miniature surgical instruments in perfect working order. Two of these instruments are exact counterparts of the surgeon's lance, one is a spear with a double-barbed head, the fourth is a needle of exquisite fineness, a saw and a pump going to make up the complement. The spear is the largest of the six tools, and is used for making the initial puncture; next the lances or knives are brought into play to cause the blood to flow more freely. In case this last operation fails of having the desired effect, the saw and the needle are carefully and feelingly inserted in a lateral direction in the victim's flesh. The pump, the most delicate of all six of the instruments, is used in transferring the blood to the insect's "stomach."—*Discovery.*

A RECENT census bulletin states that the national debt of the United States at the close of 1890 was $891,960,000. The State and local debt of the United States was $1,135,110,000. The aggregate national debts of foreign countries, $26,621,223,000.



IMPROVED SIXTY HORSE POWER GAS ENGINE.