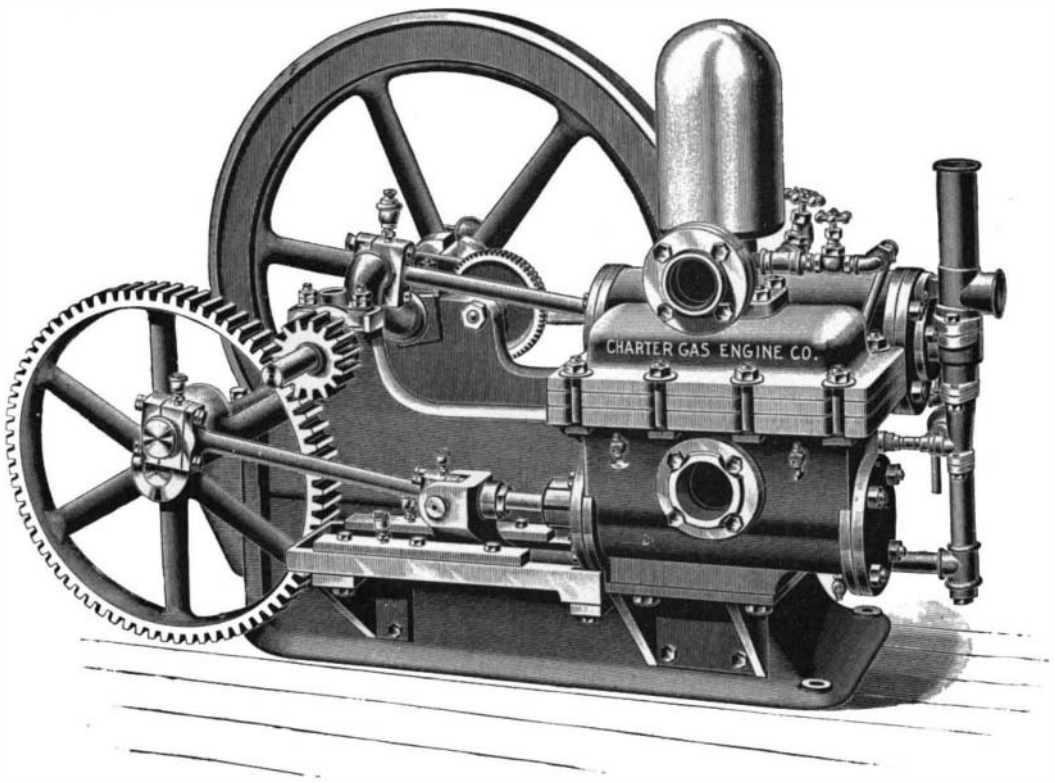
GASOLINE PUMPING ENGINE.

We give an engraving of the Charter gasoline engine and pump combined. This combination was designed for any kind of service that piston pumps are capable of. It is compactly built, a feature which, in places where floor space is valuable, is especially desirable. It is easily operated. When through pumping, nothing remains to do but shut off the gasoline. As no special attendant is required, it is especially desirable for filling railroad tanks, as the station agent or his assistant can take care of the engine and see that the pumping is done without interfering with their regular duties, thus saving the expense of employing a man to go from station to station to fill the tanks. The workmanship and material are the best obtainable. The gears are all machine cut, the pump cylinder is brass lined, and everything about the engine and pump is built on the interchangeable plan. The cut illustrates an engine and pump capable of delivering 60 gallons of water per minute against 100 or 200 feet head, or equivalent pressure. It is self-contained and may be set in operation almost anywhere. This engine is made by the Charter Gas Engine Company, Sterling, Illinois.



COMBINED GASOLINE ENGINE AND PUMP.

The Endurance of Rotating Shafts.

Some of the results arrived at by recent tests made at the Watertown Arsenal are regarded as of special importance in relation to the endurance of rotating shafts. While it has been found that great improvements in tensile strength and elastic limit have been obtained, it has not been shown whether the limit of endurance under repeated strains has been increased. In the rotating tests of cylindrical shafts, alternate tensile and compressive strains are successively applied, and under these conditions of loading no steel has yet been experimented with which will endure a continuous fiber stress of 40,000 pounds per square inch without rupturing, and this result has been reached after a total number of repetitions of from four to seven millions for steels of high elastic limit and tensile strength.

APPARATUS FOR MEASURING THE INTENSITY OF THE PERFUME OF FLOWERS.

Mr. Eugene Mesnard, one of our most clever botanists, has for several years past been making profound researches upon the perfumes emitted by flowers, and which are interesting not only from the standpoint of plant biology, but also from that of the perfumer's art. In fact, the art that consists in extracting the aroma of odoriferous bodies, and in making mixtures thereof agreeable to the smell, is a matter of no ordinary empiricism. It is only through daily practice and multiple comparisons that perfumers have succeeded in establishing the rules that define the combinations of odors that are to enter into bouquets or different toilet articles. On another hand, as regards the production of perfume by flowers, one might seek in vain for the smallest work upon the question.

The idea of an attentive study of the phenomenon, from a biological and industrial standpoint, must necessarily have presented itself to the mind of a botanist. Let us congratulate Mr. Mesnard for having taken it up, and especially for having pursued it with success. Such a study, in fact, was not one of the easiest of matters. The perfume of flowers is something so subtile, so impalpable and so difficult of comparison, that we ask ourselves how it is rendered manageable. The important point to be established in the first place is its intensity, that is to say, the greater or less action that it exerts upon the olfactory organ. The measurement of this is a very delicate matter.

The indirect method that Mr. Mesnard employed for measuring such intensity is very precise. As he remarks, although the sense of smell is not capable, as might be supposed, à priori, of estimating the intensity of an odor in absolute measure, it may be a wonderful comparer. The perfumer who has five or six hundred varieties of odors in his store is perfectly able to distinguish one from another, while it is not in his power to define their intensity with certainty. So, too, it is possible, by the sense of smell, to recognize the existence of a great number of chemical substances, but without it being possible in any way to prejudge of the quantity of such substances that are found distributed through the air. Let us suppose, then, says Mr. Mesnard, that we cause air charged with a certain perfume and air that has passed over a special volatile oil (oil of turpentine, for example) to enter a given receptacle, In this way we may obtain a mixture in which the sense of smell will detect only a neutral odor, that is to say, an odor such that it will suffice to slightly vary the proportion of the volatile oils in one direction or the other in order to detect either the perfume or the oil of turpentine. It may then be admitted that the odors are equivalent, and if we have at our disposal a method that permits of measuring the intensity of the turpentine, we shall obtain by that very fact the intensity of the perfume.

In order to estimate the intensity of the turpentine, there is taken as a basis the property that the latter possesses of extinguishing the phosphorescence of phosphorus. To this effect, there is used a little starch soaked in some sulphide of carbon in which phosphorus has been dissolved. The sulphide evaporates, and the starch, which is a very homogeneous substance, becomes impregnated with phosphorus, which becomes luminous in the air. Mr. Mesnard has shown that in order to prevent the phosphorus from glowing in a given space it is necessary to introduce therein a volume of air that is so much the greater in proportion as it is charged with a lesser weight of vapor of turpentine oil.

Oil of turpentine thus becomes a common standard for the various volatile oils, and the intensity of the perfume emitted by a given weight of volatile oil may be called the ratio between the weight of the oil of turpentine that neutralizes the perfume and the weight of this same oil which, employed alone under the same conditions, acts upon phosphorescence with the same energy.

In all experiments it is necessary to carry along the odors (which are generally heavy) mechanically by a strong current of air.

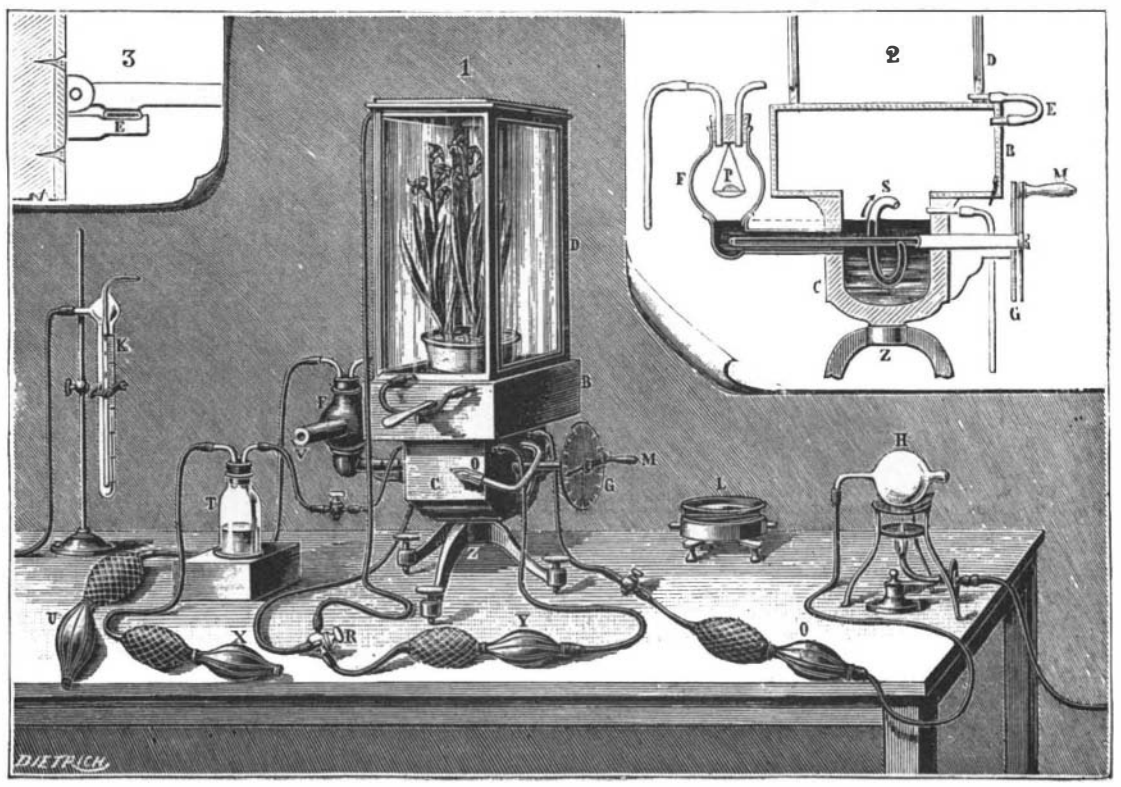
The following is the way in which Mr. Mesnard realizes all these conditions in an apparatus constructed at the laboratory of Mr. Gaston Bonnier.

The flowers, the intensity of the perfume of which is to be determined, are inclosed in a large glass case (No. 1 of the figure) placed upon a pedestal which is itself supported by a metallic tripod, Z, provided with leveling screws. This pedestal consists of two parts: (1) a narrow one, C, hollow in the interior, into which mercury is put, and (2) a wide one, B, which is separated from the glass case by a partition. These two parts form but one and the same receptacle. A rubber tube that may be closed by a lever (E, No. 3) establishes a communication between the case, D, and the mercury reservoir (No. 2). In this same receptacle likewise debouch different conduits, one of which is designed to lead the air charged with oil of turpentine coming from the bottle, T. The odors are detected in the apparatus through the tube, O.

Through the manipulation of a rubber bulb provided in front and behind with ajutages and with a three-way cock, R, it is possible at will to agitate the air either in the case, D, and the mercury reservoir communicating with it, or in each of these two parts isolatedly.

The neutral odor having been obtained as previously stated, it is a question of measuring the charge of the oil of turpentine that has produced this result. The phosphorescent substance is suspended in a blackened glass bulb, F, of about 100 c. cm. capacity that communicates, at its base, with the reservoir through a horizontal tube full of mercury. A black cardboard tube, V, permits the phosphorescence to be observed, even in the full light. For the transfer of the perfumed air from the mercury reservoir to the bulb, F, the following arrangement is employed. In the same axis of the connecting tube is placed a smaller tube, one of the extremities of which opens in the mercury just beneath the bulb. The other extremity of this tube is prolonged by a solid axis provided with a winch, M. Toward the center of the reservoir, it receives a spirally curved branch, S. In a certain initial position, the spiral and the tube that prolongs it may be entirely filled with mercury; but, if the winch be revolved, the extremity of the spiral will enter the atmosphere, and, at every revolution, withdraw therefrom a certain quantity of perfumed air, which it will carry along through the mercury to the extremity of the tube, where the air will escape, bubble by bubble, and become diffused through the bulb.

The winch is revolved until an extinction of the phosphorescence is obtained. The number of revolutions or fractions thereof is proportional to the quantity of air that has been carried along. Moreover, the spiral is graduated, and, by raising the level of the mercury in the reservoir more or less, it is possible to modify the volume. A rubber bulb, U, permits of blowing a little air upon the phosphorescent substance. Another



APPARATUS FOR MEASURING THE INTENSITY OF PERFUMES.

No. 1. D. Glass case containing the perfumes. Z. Tripod. C. Mercury reservoir. No. 2. Internal section of the pedestal that supports the case, D. No. 3. Lever for closing the tube, E, by pressure.