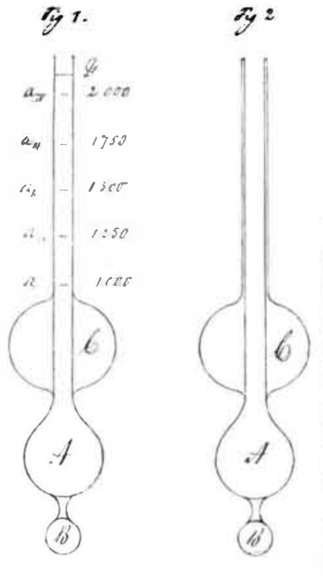
Correspondence.

A Picno-Hydrometer.

To the Editor of the Scientific American:

I send a description of a new scientific instrument of my invention; it may perhaps interest the scientific public. It is for determining the specific gravity of fluids as well as of solids. Its construction is based on the combined principles of the picnometer or specific gravity glass and the hydrometer. It is especially adapted to the determination of the gravity of fluids when only small quantities can be obtained, when they are of such a nature that they can only be kept in glass vessels, such as strong acids and the like.

A is a spherical glass vessel to which a long neck is attached, corresponding to the stem of the common hydrometer. B is a smaller closed bulb that contains shot, mercury, or other heavy object. This may be dispensed with if the bulb, A, is made of heavy glass. Around the stem or neck of the vessel, A, just above that vessel, there is blown another bulb, C, which serves as a float. The upper end of the stem is open. The instrument, instead of floating in the fluid the specific gravity of which is to be determined, is filled with a fluid to a mark, D, on the neck, and put in water. The degrees are marked on the glass by etching with hydrofluoric acid, or a paper scale may be used, as shown in Fig. 2. The paper can be inserted in the space between the two tubes, and the upper edges sealed together.



If we fill the instrument with water and let it float in water, the proportions of the instrument being such that it sinks to a, it will serve for determining the specific gravity of fluids heavier than water. If it sinks to a_{10}, then a_{10} will be 1·000 of the scale, and will serve for fluids lighter than water. In the first case, a being 1·000, if we fill the instrument with any heavier fluid and put it into water, it will sink in farther than a, say to a_1, being 1·250. As the volume of the fluids to be weighed is always the same, it will be readily understood that a similar addition to the specific gravity (as from 1·000 to 1·250 and from 1·250 to 1·500) will require equal additions to the volume of water displaced. In other words, the distances of the marks 1·000 to 1·250 and 1·250 to 1·500 will be equal, provided the stem is cylindrical. This is the only instrument having a specific gravity scale of which the degrees are equidistant. Further, if the instrument be so made that the volume of the inner vessel be known, such as 10 cubic centimeters, it can be used to weigh off any quantity of a fluid or solid substance (which must be in pieces small enough to enter) from 10 to 20 grains, or as far as the scale goes. The instrument may thus serve as a balance for preparing solutions of standard strengths. It may be also used for determining the specific gravity of solids. The method is nearly the same as with the usual specific gravity glass or picnometer and the chemist's balance. Thus: Given a substance not soluble in water, the specific gravity of which is x. If we put enough of it into the instrument to make it sink in water to 1·250, and fill up with water to the mark, and immerse again in water, it will sink now to, say, 1·750. Then calling the absolute weight of the water which the instrument will hold w, the absolute weight of the substance will be $w \times 1{\cdot}250$. The weight of the contents of the instrument, after filling up with water, will be $w \times 1{\cdot}750$, and the weight of the water added will be w (1·750 — 1·250), and the weight of the water displaced by the substance $w - w\,(1{\cdot}750 - 1{\cdot}250) = w\,(1 - 1{\cdot}750 + 1{\cdot}250 = w \times 0{\cdot}5$. By dividing the absolute weight of the substance by the weight of the water it displaces, $\frac{w \times 1{\cdot}250}{w \times 0{\cdot}5}$, we show its specific gravity, 2·500.

The results of the determinations with this instrument are not influenced by variations from the mean temperature, as the gravity of the fluid is always compared with water of the same temperature.

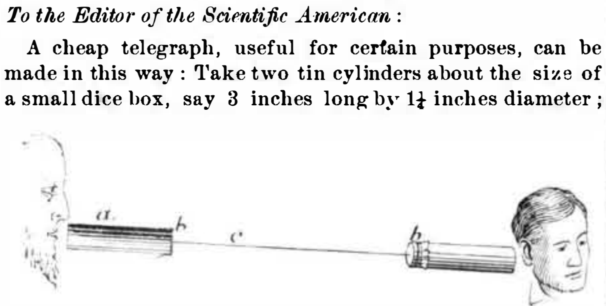
Your readers will doubtless find many uses to which this little instrument can be put. HERMANN WIEGAND.

St. Louis, Mo.

A Thread Telegraph.

To the Editor of the Scientific American:

A cheap telegraph, useful for certain purposes, can be made in this way: Take two tin cylinders about the size of a small dice box, say 3 inches long by 1¼ inches diameter;



THE TWO CENT TELEGRAPH.

cover one end of each with parchment or bladder, forming a drumhead. Pierce the center with a pin and insert a strong thread, and make a knot to prevent its being withdrawn. With the other end of the thread (which may be of any length, say 100 yards or more) do likewise with the other cylinder, and the telegraph is complete. By keeping the thread tightly drawn, in order that the vibration may be perfect, a person speaking or even whispering in one cylinder can be distinctly heard by another holding the other cylinder to the ear.

Would not such home-made pocket telegraphs be very useful in factories, on farms, in the army, and in many other situations too innumerable to mention? An enterprising person might realize a handsome sum by making them as scientific toys for the Centennial Exhibition. The tubes could be made of cane pole, and I would suggest that they be made to fit one within the other, so as to be easily carried. Stronger ones can be made with small cord, but would be more bulky. GEO. QUINCY THORNDIKE.

Mentone, Alpes Maritimes, France.

[For the Scientific American.]

SETTING ENGINE GUIDE BARS.

Several of our correspondents are troubled with the difficulty of setting the guide bars upon the bed of a horizontal engine so as to ensure that the piston head has an equal amount of clearance, from the cylinder head, at each end of the stroke, and at the same time so that the guide blocks will travel to an equal amount over the recesses at each end of the guide bars. Below we give a practical method of obtaining this result.

Our first operation is to ascertain the length of the bore of the cylinder, measured from inside face to inside face of the cylinder covers, which we may do by subtracting from the whole length of the bore the depth to which the covers enter it at each end; then from the remainder we subtract the thickness of the piston head, exclusive of the bolt heads, if they project; and the last remainder will be the length of the bore of the cylinder (allowed for the stroke of the piston) *plus* the clearance between the cylinder covers and the piston head when it is at each end of the stroke. From the remainder so obtained, we subtract the length of the engine stroke, that is to say, twice the length of the crank from the center of the shaft to the center of the crank pin; and this last remainder will be the amount of length of the bore of the cylinder allowed for clearance, which, divided by 2, will give the amount of clearance at each end of the stroke. If, then, we add the amount of this clearance to the depth to which one cylinder cover fits into the cylinder, the sum will be the distance from the face of the piston head to the end face of the cylinder. Then we may carefully clean and oil the cylinder bore, piston rod, and piston, and then put the latter in its place in the cylinder, taking care that the distance from the face of the piston head to the end face of the cylinder end is that ascertained as above; and then the piston will be at one end of its stroke, and will allow amounts of clearance, equal at each end of the cylinder.

Our next operation is to find the exact position of the crosshead when it is at that end of the stroke which corresponds with the position of the piston; and we proceed as follows: There should be upon all guide bars a recess at each end of the working face, so that the guide blocks will, at each end of the stroke, travel over these recesses, and thus prevent the formation of shoulders on the guide bars. The distance, then, on each bar, between these recesses will be less than the length of the stroke; and we therefore subtract the distance from recess to recess, on a bar, from the length of the engine stroke, and the remainder will be the amount allowed for the guide bars to travel over the recesses, which, divided by 2, will give the allowance for overtravel at each end; and we mark such allowance upon the guide bar at the end corresponding to the end of the stroke at which the piston stands. We now place the crosshead upon the piston rod, and then put the guide blocks upon the crosshead, and adjust the guide bars upon the engine bed, so that the end of the guide block stands even with the mark above referred to, and the operation is complete.

New York city. JOSHUA ROSE.

A Great Explosion.

A tremendous explosion of the nitroglycerin compound known as rend-rock powder recently occurred on Bergen Hill, New Jersey, directly opposite New York city. The material was to be employed for blasting in the new tunnel of the Delaware, Lackawanna, and Western Railroad Company, and was stored in a brick magazine some ten by twelve feet in area and nine feet in hight. Estimates place the amount of powder that blew up at about four hundred pounds. The concussion was terrific, and the effects were felt over a radius of some ten miles. Thousands of sashes and doors in the vicinity were forced in, and even across the river in New York the glass in edifices along the water front was shattered. Houses at a distance of nearly five miles were perceptibly shaken. Fortunately the building in which the powder was stored was located in a large empty lot and on the brow of the hill; and the force of the explosion spending itself eastwardly, most of the fragments were hurled harmlessly into the marsh below. The great damage which must have ensued had the locality been thickly built up was thus avoided; and the injuries were confined to the wholesale destruction of doors, windows, and ceilings in the neighborhood.

The cause of the disaster is unknown. The accident points to the necessity, however, of the enforcement of stringent laws, preventing the storing of any of the new and powerful explosives, in large quantities, in the vicinity of any populated district, and also regulating its transportation

Influence of Light on the Color of Flowers.

Dr. Askenasy, in the *Botanische Zeitung*, records the results of some experiments instituted by him to ascertain the influence of light on the colors of different flowers. In the main, his results agree with those obtained by Sachs; but if the different plants he employed to test the degree of influence exercised by light can be regarded as of equal value, then the degree of influence is very diverse in different plants. Scarlet and white, scarlet and yellow, and wholly yellow flowered sorts of *tulipa Gesneriana*, grown in absolute darkness, exhibited no appreciable difference in the shape or color, or intensity of color, of the flowers from those of the same varieties grown in the full light. Blue and yellow flowered varieties of *crocus vernus* developed their proper colors, but the flowers were very much drawn up, as gardeners express it. The effects of light on a dark violet blue variety of *hyacinthus orientalis* were of a double nature, with the same temperature. Those grown in the light were at least a fortnight in advance of those grown in the dark, and much more highly colored, though those grown in the dark were not absolutely colorless. To prove this, Dr. Askenasy cut off the upper portion of the spikes of several of the plants growing in the dark, and placed these portions in water, fully exposed to light, on the south side of a greenhouse. In three days the expanding flowers were of as deep a hue as the normal ones, proving also that the change of color so effected was entirely independent of previous formation of chlorophyl. The flowers of *pulmonaria officinalis* formed less color according to the stage of their development when darkened, and those in a very young state were quite white. The flowers of several other plants were affected in the same manner; hence it appears that those cases in which the colors are not influenced by light must be regarded as exceptional.—*Academy*.

Union of the Caspian and Black Seas.

The present century has witnessed several remarkable achievements in marine engineering, such as the drainage of extensive arms of the sea in Holland, the construction of the Suez Canal, and the deepening of the estuary of the Mississippi; and these not being enough, still more gigantic schemes have been projected. It has been proposed to admit the Mediterranean into two extensive tracts of the Sahara, which would give water communication to a large portion of Algeria, and make a seaport of Timbuctoo. Neither plan is likely to be put speedily into execution; but in the meantime, Mr. H. T. Spalding, of Blomfield, N. J., comes to the front with a proposal to turn the waters, of the Black Sea into the Caspian, thus enlarging the latter to its pristine size, and turning the barren and almost impassable deserts, left by the subsidence of its waters, into a highway of commerce for Central Asia. This ancient sea basin is considerably depressed below the general ocean level, and has been silted up in the course of ages by the Ural, Volga, and other lesser streams which flow into it. The consequence of this contraction and shallowing of the Caspian has been, not only that the land left dry is incurably barren, but that the surrounding country has become unfruitful from want of rain, consequent on the diminished evaporation. Mr. Spalding proposes, as we have said, to restore to the Caspian its ancient body of waters, its ancient depth and area, which was nearly double its present extent, by connecting it with the Black Sea by a channel 150 miles in length, about 170 yards wide at its eastern extremity, but two thirds narrower on the western half. The projector calculates that, at the end of forty years from the beginning of the work, the level of the two seas would be so nearly uniform that the navigation of the new channel could begin. Mr. Spalding further proposes to join the Don to the Volga, and thus lay the Sea of Azof also under contribution. The mere excavation of the proposed canal does not seem very difficult; and as the Russian government appears to have directed its attention to the scheme, doubtless the opinion of competent scientific men as to its feasibility will be obtained. If it should prove successful it would be a magnificent work, and followed by political and economic results more than commensurate with the skill and outlay that would be required for its completion.—*Iron*.

New Discovery in Agriculture.

The curious discovery is announced by Professor P. B. Wilson, of Washington University, Baltimore, that minutely pulverized silica is taken up in a free state by plants from the soil, and that such silica is assimilated without chemical or other change. The experiment, of which we give a more full account in our SUPPLEMENT of this week, consisted in fertilizing a field of wheat with the infusorial earth found near Richmond, Va. This earth, it is well known, consists of the shells of microscopic marine insects, known as diatoms, which under strong magnifying powers reveal many beautiful forms that have been resolved, classified, and named. After the wheat was grown Professor Wilson treated the straw with nitric acid, subjected the remains to microscopic test, and found therein the same kinds of shells or diatoms that are present in the Richmond earth, except that the larger sized shells were absent: showing that only silica particles below a certain degree of fineness can ascend the sap pores of the plant. This discovery opens up a new line of research in agricultural investigation from which important results and much additional knowledge may accrue.

THE AMERICAN CENTENNIAL JURIES.—The list of jurors at the Centennial was announced just as this issue was going to press, and the names will appear in our next.

ENGINEERING projects are under advisement for the regularization of the river Neva at St. Petersburgh, Russia.