ful to general machinery and the cylinders of steam engines.

The careful general attention we have noticed, also, as a rule, extends to the oiling of all parts of the operating "heads" of spinning mules, both for hand and self-operating, so that only the heating of main or counter shafting for want of oil, and the slipping of loose belts on pulleys, remain as agents of fire in the spinning room. Neither of these is very likely to cause such accident, because most factories now use self-oiling hangers, which, though they need not be replenished with oil for months, are, or ought to be, felt daily, to discover if, by warmth, they show any defect in their working. Belts when slipping almost always "squeal" with the friction, so that their want of being "taken up" is soon attended to. Even were it unnoticed, the slipping could hardly generate sufficient heat to be dangerous, though electricity would be excited, which in a cotton mill might, if long continued, cause ignition of light flyings.

These remarks apply to the spinning department, but other parts of cotton, woolen, and worsted mills are much more likely to have fires arising from friction, as, for instance, the picker, carding, and preparing rooms, where every prudent manufacturer takes extra precautions.

There is one part of the worsted process where an imminent danger from fire seems to exist, but we have never heard of any serious loss occurring therefrom. In the worsted combing machine the long woolen fibres, as they are drawn out by the iron fingers, pass very closely but rapidly over a series of gaslights burning with a low flame. This high degree of heat, directly applied, is required in this process for reasons which it is not necessary to explain here; and, of course, if the machine were suddenly to stop working, the wool remaining over the flame would ignite. It is a special duty of the attendant to watch that this does not occur, and we believe that each drawing frame is now furnished with a self-acting safety apparatus, extinguishing the lights if the machine stops working. At any rate, great care is needed, because the open light in that position is known to be a source of danger, and such care, as already intimated, has largely prevented fires from occurring in these machines.

In many cotton and linen spinning mills (more especially in thread mills), singeing machines are used in which a number of single or twisted threads are all at the same time drawn rapidly through a gas flame, to rid the surface from projecting filaments. Should this machine cease running, and the flame be continued, a fire would result; but this is generally well guarded against, both by the attention of employés and a safety apparatus for extinguishing such flame.

This "fire protector" has now, we believe, an attachment to each thread, consisting mainly of an eye through which the thread runs, the eye being connected with delicate levers, which turn off the gas, so that if the thread break and the eye drop, the flame is instantly extinguished. The sudden stopping of a machine of this kind is never allowed when at work, without the lights being put out, except when it is accidentally caused by the breaking or flying off of a driving belt. In such case, the first act of the attendant is to extinguish all the flames before the motion of the wheels is perceptibly checked.

More care is required in these singeing frames than in the worsted combing frames, because of the higher inflammability of the material, and also because should a thread break and the protector not instantly work, the thread at the back of the eye may pile forward and ignite itself and all other threads on each side of it. All recent singeing machines have, we believe, the separate attachments mentioned to each thread, though in former years it was not so. The improvement renders the machines much more costly, but greatly diminishes their fire risk.

In some factories certain kinds of fine cotton and linen fabrics are singed after the weaving, by being drawn rapidly over a low, continuous gas flame. In such machines, stopmotions for the gas, and great care and precaution in management, are necessary for the safety of the cloth and the mill.—*American Exchange and Review.*

Caventou.

Caventou, the distinguished French chemist, died in Paris in May last at the age of 82. Medicine is indebted to him for some of its most valuable remedies. In conjunction with Pelletier, Robiquet, and others, he discovered strychnia in 1818, brucia and veratria in 1819, quinia and cinchona in 1820, and caffeina and theina in 1821. The discovery of quinia should of itself immortalize his name. Though laden with the highest honors which a gratified country could bestow, he was one of the most modest of men. Just before his death he requested to be buried without military honors, and that no discourse should be pronounced over his tomb. His request was complied with, though all the members of the Academy of Medicine and of the School of Pharmacy attended his obsequies.

What the Telephone Might have been Called.

We prophesied even better than we knew the other day when we said that the adoption of so short a name as "Fernsprecher" for the telephone by the Germans was a matter of congratulation, because they would otherwise soon find a way of smothering it under some frightfully polysyllabic title. To show how closely the fortunate instrument has escaped this fate, a correspondent in Heidelberg writes us that no less than fifty-four names were proposed in German, all of varying degrees of length and atrocity. Some (we will not inflict the reader with the original titles) signified "mile tongue," "kilometer tongue," "speaking post," "word lightning," "world trumpet," and finally one inventor, collecting all his energies for a grand effort, triumphantly produced "doppelstahlblechzungensprecher." The jaw can be replaced by pressing on the lower molars with the fingers, and guiding the muscles with the thumbs.

ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, January 16, 1878.

PLANETS.

	H.M.		H.M.
Mercury rises	5 59 mo.	Saturn sets	7 20 eve.
Venus sets	6 23 eve.	Uranus rises	5 25 eve.
Mars sets	11 42 eve.	Uranus in meridian	0 15 mo.
Jupiter rises	5 19 mo.	Neptune sets	11 7 eve.

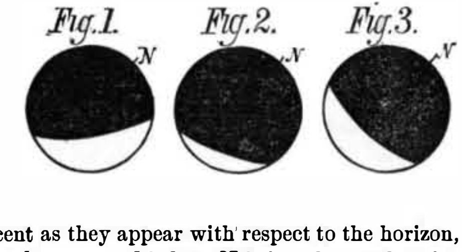
FIRST MAGNITUDE STARS.

	H.M.		H.M.
Antares rises	2 17 mo.	Sirius in meridian	8 52 eve.
Regulus rises	5 31 eve.	Procyon in meridian	9 45 eve.
Spica rises	10 08 eve.	Aldebaran in meridian	6 42 eve.
Arcturus rises	9 10 eve.	Algol (2dmg.var.) in merid.	5 13 eve.
Altair rises	3 31 mo.	Capella in meridian	7 20 eve.
Vega sets	5 40 eve.	7 stars (cluster) in meridian	5 53 eve.
Alpheratz sets	10 05 eve.	Betelguese in meridian	8 01 eve.
Fomalhaut sets	5 03 eve.	Rigel in meridian	7 21 eve.

REMARKS.

The most remarkable event of the week is a partial eclipse of the moon February 17, in the morning. The beginning and middle only are visible, the setting eclipsed. The last contact of the moon with the shadow occurs 51 m. after sunrise and 49 m. after the setting of the moon, and is invisible east of the Mississippi river. The eclipse begins at 4 h. 47 m. morning; middle, 6 h. 15 m. morning; end, 7 h. 43 m. morning. For the time of beginning, middle, and end at any other place, add the difference of time longitude if east, subtract the same if west of New York city. Examples: Boston, 12 m. east, begins at 4 h. 59 m. morning; Philadelphia, 4 m. west, begins at 4 h. 43 m. morning. The following figures represent the phases of the illuminated

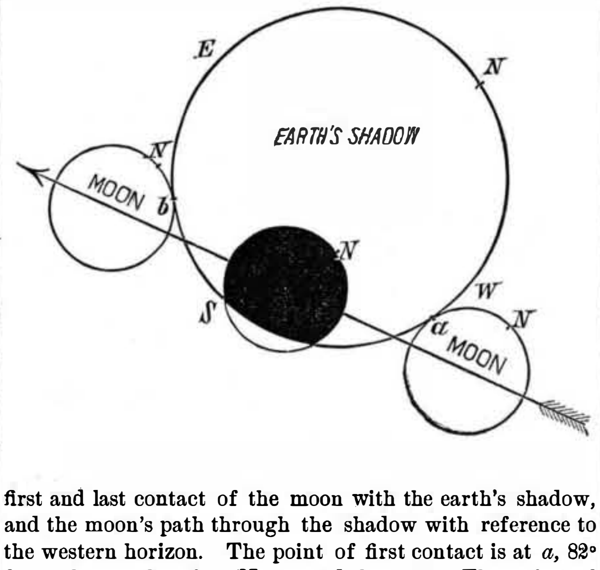
Fig.1. Fig.2. Fig.3.



crescent as they appear with respect to the horizon, at three intervals, as stated below, N being the north point. Fig. 1 represents the phase at 5 h. 45 m. morning, one half hour before the middle, and 58 m. after beginning, the moon being about one hour high. Fig. 2 shows the phase when at the middle, or when the eclipse is largest, 1 h. 28 m. after first contact, the moon being 39 m. high. At this time ·84 of the moon's diameter will be in the earth's shadow. This multiplied by 12 gives the size of the eclipse in digits, which is 10·08 digits. Fig. 3 shows the phase at 6 h. 42 m. morning, 10 m. before the moon sets, and one half hour after greatest obscuration.

Fig. 4 shows the middle of the eclipse and the points of

Fig. 4.



first and last contact of the moon with the earth's shadow, and the moon's path through the shadow with reference to the western horizon. The point of first contact is at *a*, 82° from the north point (N) toward the east. The point of last contact, *b*, is 31° from the north point toward the west. Hold the engravings so that N will point toward the north star.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations of the following notes, which are merely approximate, have been made by students in the Astronomical Department of Vassar College.

Position of Planets for February, 1878.

Mercury.

On February 1 Mercury rises at 5h. 49m. A.M., and sets at 3h. 6m. P.M. On February 28 Mercury rises at 6h. 11m. and sets at 4h. 15m. P.M.

Mercury is at its greatest elongation west from the sun on February 2, and should be looked for before sunrise, south of the point of sunrise.

Venus.

On February 1 Venus rises at 8h. 2m. A.M., and sets at 7h. 43m. P.M. On February 28 Venus rises at 5h. 30m. A.M., and sets at 5h. 1m. P.M.

Mars.

Mars rises on February 1 at 10h. 21m. A.M., and sets at 11h. 53m. P.M. On February 28 Mars rises at 7h. 19m. A.M., and sets at 11h. 35m. P.M.

Mars is becoming more distant, and therefore smaller, but is easily recognized, and by February 8 will be known by its approach to the moon, then nearly at first quarter. The recent report of Professor Pickering, of the Observatory of Harvard College, gives the diameters of the two satellites of Mars as determined by the 15-inch telescope. The outer satellite is six miles in diameter, and the inner seven miles. Only a few of the very largest telescopes can render such minute bodies visible.

Jupiter.

Jupiter has passed to the western side of the sun, and must be looked for before sunrise.

On February 1 Jupiter rises at 6h. 10m. A.M., and sets at 3h. 22m. P.M. On February 28 Jupiter rises at 4h. 44m. A.M., and sets at 2h. 4m. P.M.

Saturn.

The ring of Saturn is at this time (January 15) exceedingly narrow, looking like a bright line projecting on each side of the planet. It will become more and more threadlike, and, according to the *Nautical Almanac*, will disappear on February 6. As Saturn shines by reflecting the light of the sun, when the sun is in the plane of the ring only its edge is illuminated, and this edge being supposed to be less than a hundred miles in width, cannot be seen at so great a distance. Astronomers will watch this disappearance of the ring with great interest, although Saturn ranges so nearly with the sun in February that only a few early evening hours can be used.

On February 1 Saturn sets at 8h. 8m. A.M.; on the 28th at 6h. 39m. P.M.

Uranus.

Uranus is in its best position in February, coming to the meridian on the 18th very near midnight, at an altitude of about 61°. It will at that time be west of the star Regulus by 41', and above that star by half a degree, or the diameter of the moon.

On February 1 Uranus rises 6h. 25m. P.M., and sets at 7h. 59m. of the next morning. On the 28th Uranus rises at 4h. 33m. P.M., and sets at 6h. 11m. of the next day.

Neptune.

On February 1 Neptune rises at 10h. 43m. A.M., and sets just after midnight. On the 28th Neptune rises at 8h. 58m. A.M., and sets at 10h. 23m. P.M.

Another Railway Bridge Disaster.

The Ashtabula bridge disaster seems to have been repeated on a smaller scale in the recent breaking down of a bridge near Tariffville, on the line of the Connecticut Western Railroad, during the crossing of a passenger train. The structure was a Howe truss of two spans, each 163 feet in length, supported in the middle by a pier of solid masonry. The height over the stream was 10 feet. The train consisted of two 60 ton locomotives and appendages, six heavily laden passenger coaches, one baggage and two freight cars. The first span was crossed in safety, but when the locomotives reached the middle of the second span, the right side suddenly settled, a break followed, and the cars crashed through. Thirteen persons are known to have been killed, and many others are injured.

The bridge is said to have been in good condition, and the timbers where broken off and splintered exhibit no signs of deterioration. The calamity seems simply to have been owing to the weakness of the structure, the iron tie rods of which appear to have given way first, under the unusual weight of the two locomotives and loaded train. That any railroad bridge should have fallen under such a load is incomprehensible if the construction had been correct in the beginning. The commonest test of such a structure is to run as many locomotives or cars loaded with iron upon it as can be accommodated on both tracks; but even this proceeding is little more than a matter of show for the benefit of the general public, because the engineer knows if he has designed the members of the structure to withstand any load to which they are likely to be subjected, and adopted a factor of safety of 6 besides, that even a double line of locomotives should produce no material deflection. If this bridge simply fell because it could not stand the strain, it was extraordinarily weak, and that fact must have been patent from the outset. It might be well for those charged with the investigation of this disaster to examine into the safety of other railway bridges on the road; and indeed, the matter of overhauling the plans of all their bridges with a view to observing whether their ultimate breaking strength reaches proper limits, or has deteriorated therefrom, might be commended to railway engineers and managers as a good winter's work.

Mechanical Theory of Forgetfulness.

To the Editor of the Scientific American:

Your number for January 12 contains some speculations on a new theory of a Mr. Verdon under the above heading. Permit me to say that this theory, or rather conjecture, will not stand the least examination. Were it true, people who are entirely illiterate ought to have immense potential capacity, and ought to attack any given study with immense advantages. Every one knows that the contrary is the case.

The more the memory is cultivated the more active it be comes. A second foreign language is learned more easily than the first, and so on.

This is the age of bald and barren speculation. Alongside of those who earnestly and patiently labor for the truth are those who tie a few stray facts together and deduce a string of paragraphs. As for Mr. Verdon's theory, it corresponds with his own name. ALIQUIS.

Coal Dust Fuel.

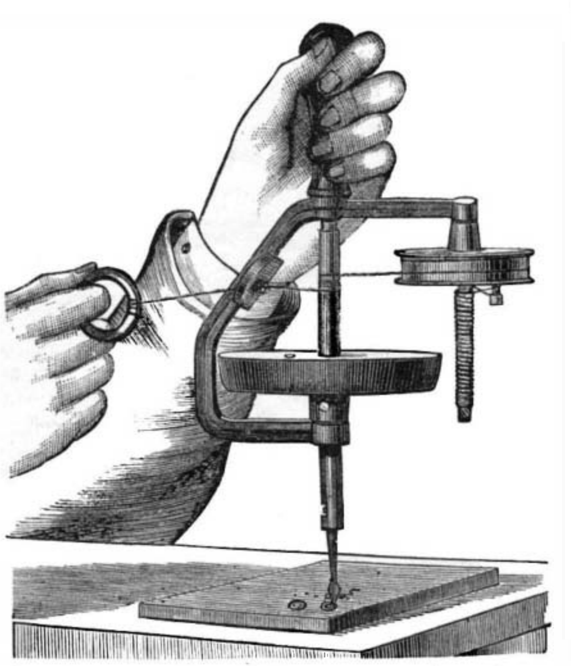
To the Editor of the Scientific American:

I notice your article of January 9, on burning coal dust with a blower, and wish to speak of the disadvantages of this method and its remedy. When a blast is used on fine coal dust, nothing can keep a large amount of fine particles of fuel from being blown out at the top of the chimney, and this has resulted in numerous cases of fire and the total destruction of mills and surrounding property. It makes an unnecessary waste of fuel by virtually melting the coal on the grates; again, it injures the boiler by having a steady blast on the same spot, and a boiler run with a blower will not last near as long as without it. It requires considerable power to run a blower, also more than the users suppose, as shown by indicating the engine on different parts of machinery. Coal dust, with small mixture of soft coal, is now being used as fuel, without the use of a blower, on boilers set with the Jarvis furnace, at Boston, Worcester, Providence, Brooklyn, Jersey City, New York, and other places. By this setting, the gases generated on the grate are utilized by hot air; the joining of the gases, carbonic oxide with the oxygen, makes an immense flame. The gas flame is formed on the principle of the blow-pipe. Three boilers set this way will make as much steam as five the old way.

Boston, Mass. A. F. UPTON.

QUICK-SPEED DRILL.

We extract from *Iron* the annexed engraving of a new quick-speed drill, which consists of a frame, a spindle with the socket for the drill, a pulley with a spiral spring, and a hollow casting which acts as a flywheel and also serves as a



QUICK-SPEED DRILL.

case to contain the ratchet and pawl necessary to prevent the possibility of the motion of the drill becoming reversed. The action is as follows: The workman on drawing his hand toward him actuates the drill, and at the same time tightens the spring attached to the pulley, which spring, on the tension of the hand being relaxed, reverses the motion of the pulley and takes up the slack of the cord; but the motion of the drill is not reversed, owing to the ratchet and pawl in the flywheel, and to the rotation of the flywheel itself. There is thus obtained for the drill a constant revolving motion, with a speed which can be regulated to suit any metal from the hardest to the softest, while the feed, which is effected by the hand, is at all times felt and controlled. These machines can be worked in any position, and, from the important fact that the motion is continually in the same direction and that there is consequently no pause in the cutting, the work can be got through in less time and with far less breakage of drills than by the older contrivances. They are as yet made only in a very small size, and are therefore serviceable chiefly to the makers of small machinery, such as clocks, sewing machines, etc.

NEW YORK ACADEMY OF SCIENCES.

A meeting of the Chemical Section of the New York Academy of Sciences was held on Monday evening, January 14, at their rooms, 64 Madison avenue, Dr. Eggleston in the chair.

Mr. George F. Kunz exhibited a specimen of alexandrite from the Ural mountains. It is purple by night and deep green by day. He also showed a specimen of harmotone, a silicate of baryta and alumina, from a new locality in Brazil.

Mr. Chamberlin exhibited specimens of anchorite from the Phœnixville Tunnel, and of fulgurites from Carrol county, Ill. The latter are partially fused and vitrified tubes of sand produced by the action of lightning.

Professor D. S. Martin announced the appearance of the first number of the "Annals of the Academy."

NITRIC ACID IN HEALTHY URINE.

Professor Albert R. Leeds then read a paper on the presence of nitric acid in healthy urine, and a method for its quantitative determination.

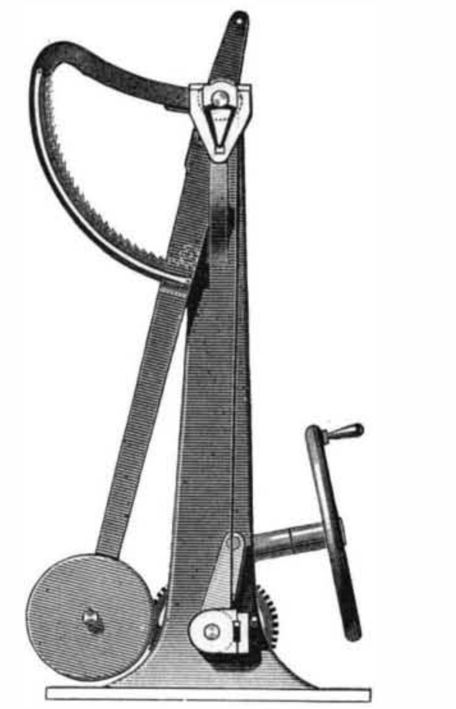


Fig. 2.—WIRE TESTER.

In the course of some experiments to determine the relative amounts of oxidized and non-oxidized compounds existing in drinking water (described in the SCIENTIFIC AMERICAN of January 5), it became important to ascertain this relation in the case of urine, one of the organic impurities of some drinking waters. The Passaic water consumed by the inhabitants of Hoboken contains ten times as much nitric acid as of free and albuminoid ammonia. In passing through the system, the nitrates present in the water undergo reduction, and if they are not assimilated or voided as non-oxidized nitrogenous substances, may be expected to appear to some extent at least in the urine. Although no mention is made of the presence of nitric acid in healthy urine in any of the works to which the speaker had access, he determined to submit the question to the searching methods of inquiry which a recent discovery had placed in his hands.

A retort was freed from all traces of ammonia by distilling pure water in it; 1·023 grammes of fresh healthy urine were then added, and the distillation continued. The distillate was collected in portions of 50 or 100 c. c., pure water being added as was necessary. In each case the ammonia passing over was separately determined by means of the comparator previously described. The ammonia came over in continually decreasing amounts, the total amount evolved in 15 distillations being 1·725 milligramme. The decomposition of what remained was then accelerated by the addition of a gramme of sodium carbonate. The ammonia contained in 56 distillates amounted to 7·1525 milligrammes. In the next place 50 c. c. of a solution of potash and potassium permanganate were added to what remained in the retort. The first distillate then yielded 0·32 and the twenty-second 0·005 of a milligramme of ammonia.

Total for the 22 distillates..........	1·31	mgrm.
" with sodium carbonate	7·1525	"
" by simply boiling...........	1·725	"
	10·1875	

From the last result the conclusion was drawn that all the albuminoid ammonia had been obtained, and that reducing agents should now be used to decompose any oxidized nitrogenous substances which might be present.

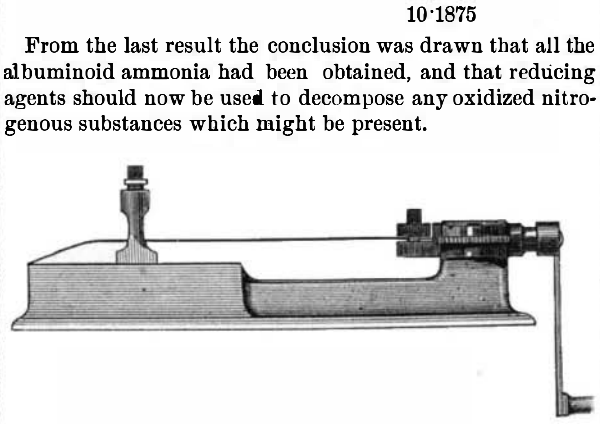


Fig. 3.—TWISTING WIRE TESTER.

Six grammes of zinc were digested with a slightly warmed solution of neutral cupric sulphate, and after careful washing the residue, together with freshly precipitated copper, was introduced into the retort. The following result was then had:

1.	100 c.c. =	...0·10	mgrm.	9.	100 c. c. =	...0·0575	mgrm.
2.	"	....0·03	"	10.	"	...0·0325	"
3.	"	....0·025	"	11.	"	...0·06	"
4.	"	....0·0125	"	12.	"	...0·065	"
5.	"	... 0·04	"	13.	"	...0·0225	"
6.	"	....0·16	"	14.	"	...0·0005	"
7.	"	....0·07	"	15.	"	...0·0000	"
8.	"	....0·12	"	16.	"	...0·0000	"
Total						...0·7955	

From this result must be subtracted 0·29 mgrm., the amount of ammonia previously ascertained as existing in the form of an impurity in 50 c. c. of the permanganate solution used in the distillation.

This leaves 0·5055 mgrm. of ammonia due to the reduction of nitrates in the urine, and corresponds to 1·887 mgrm. of nitric acid or 0·18 of 1 per cent. Professor Leeds concluded by reading letters bearing upon the subject from Professor Theodore Wormly, Dr. Ezra M. Hunt, and Professor Robert O. Rogers.

Remarks were made by Drs. Ellsberg and Hopper, who expressed their belief that nitric acid might reasonably be expected to be a normal constituent of urine.

On motion of Dr. Ellsberg, a vote of thanks to the Rev. J. J. Robertson was passed for his donation of 37 volumes to the library of the Academy. Adjourned. C. F. K.

PAPER AND WIRE TESTERS.

We illustrate three testers for special materials. Fig. 1 shows a paper tester, which works with unvarying accuracy and absence of liability to derangement. As the paper is tested by the direct action of a weight, all the variations which arise in the use of springs for this purpose are entirely avoided, and continued working has no tendency whatever to cause the machine to give inaccurate tests. The machines are all graduated by the application of actual weight, in such a manner as to insure every one being perfectly accurate, and as all parts of the mechanism are fully open to view, it can without difficulty be kept clean and always ready for use. The machine is in use by many of the largest paper users. It is very portable, occupies but little space, and can be worked with considerable speed even by an inexperienced operator.

The wire testers, Figs. 2 and 3, are the invention of Mr. Carrington, of London, who having, as engineer of the Wire Tramways Company, found the want of a machine by which the wires composing the ropes used could be expeditiously and accurately tested, without the great expenditure of time required by the use of the ordinary forms of testing machines, designed the apparatus shown. By it a wire may be attached and tested both for tenacity and ductility in the space of one minute. The machine requires no foundation, when not in use occupies very little space, and can be used by one work-

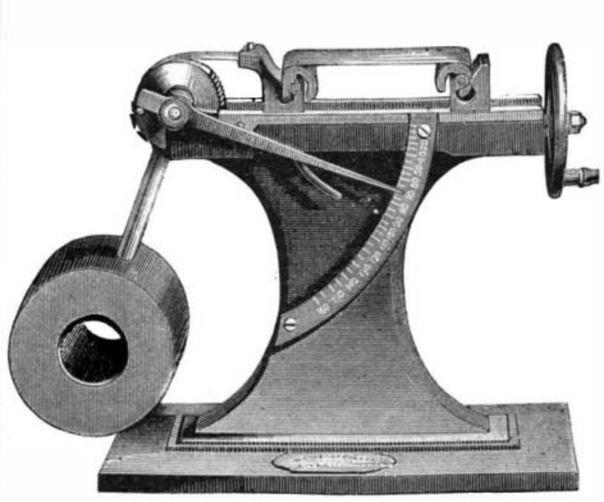


Fig. 1.—PAPER TESTER.

man of ordinary intelligence. As the strain is applied very gradually, and by the application of the same weight, all liability of erroneous tests from changing or moving of weights, as in ordinary machines, is avoided. The extension of the wire also is accurately measured, and a length of 50 inches can, if necessary, be tested, thus giving a much truer result than if a short piece were subjected to tensile strain. The smaller machine, Fig. 3, is used for testing the wire by twisting one end while the other is held firmly in the machine, the greater number of twists it will bear being the better evidence of its softness. These machines will test either up to 3,000 pounds or 5,000 pounds, as required.

We are indebted to the *British Trade Journal* for our engravings.

Soap-Bubble Lecture Experiment.

BY IRA REMSEN.

In setting fire to soap-bubbles filled with hydrogen or with oxyhydrogen gas, it is customary to make use of a taper at the end of a rod, which is managed by the assistant. Every one knows that the operation is apt to be a clumsy one, and, besides being annoying to the assistant, it is usually distracting to the audience and the lecturer. I have lately made use of a simple contrivance, which I am led to mention, as it is in every way more satisfactory than the usual arrangement, and works perfectly.

At a height of five or six feet or more above the center of the lecture table a glass funnel of the largest size is suspended by means of wires attached to the ceiling, or some other appropriate support, the broad part of the funnel being directed downward. A fish-tail gas burner is fixed horizontally at the center of the mouth of this funnel, so that, when the gas is lighted, the broad flame is spread out in a horizontal plane over as much of the space included in the mouth of the funnel as it will cover. The attachments may be made to suit the conditions of the room and table. It would be a simple matter to have a permanent gas jet arranged in an appropriate position for the experiment.