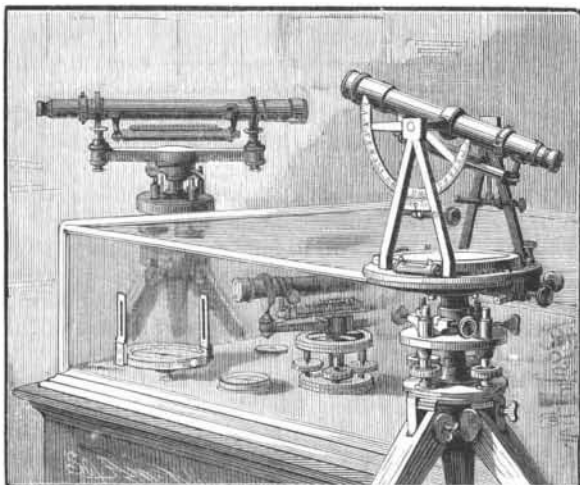


**THE MANUFACTURE OF SCIENTIFIC APPARATUS.**

Thirty-five years ago, Mr. James W. Queen, a gentleman of scientific attainments and great business ability, began in the city of Philadelphia a small business in optical and philosophical apparatus. In 1859 he associated with him Mr. Samuel L. Fox, and under their personal supervision and management the business steadily developed and quickly outstripped similar establishments. In the year 1870 Mr. James W. Queen withdrew, and Mr. S. L. Fox continued and still con-

**ENGINEERING INSTRUMENTS.**

tinues the business under the old title of James W. Queen & Co. Different branches were gradually added until the business became the largest and most comprehensive of its kind in the United States or in the world. The progress and development of this business is, without doubt, a fair index of the scientific progress of this country. In time the business became so large that it was found necessary to arrange the different branches under different departments, with a competent man at the head of each department.

There are at present six departments, arranged under the following heads: Physical and chemical, engineering, ophthalmic, microscopical, the magic lantern department, and the photographic department. The headquarters of these departments are at 924 Chestnut Street, Philadelphia, at the site occupied originally by Mr. Queen; but the business having enormously outgrown the building, some of the departments were obliged to seek quarters for apparatus in other buildings in the vicinity of the main offices of the establishment. The factory in which are made a large proportion of the instruments and apparatus sold by Queen & Co. was long ago removed to more commodious quarters, now occupying a floor extending through a city block and fifty-five feet in width.

Although the importation of fine instruments for demonstration and for commercial use is a large and important part of the business of the concern, the

Co. One of the features which first attracts the attention of visitors to the shop is a machine for testing anemometers. A pair of anemometers are attached to a long beam, which is rotated at a known velocity. This is, of course, the equivalent of causing the air to pass the anemometers at the same velocity. By means of the rotating beam the instruments are carried through the air at different velocities, ranging from a fraction of a mile per hour up to the velocity of a cyclone, and the instruments are adjusted to accurately indicate and record the velocity.

The thermometers and barometers used by the government are made here. An order from the government for a large number of microscopes of special design for testing certain adulterations of food has recently been completed.

The microscopes of the various "Acme" patterns are made here, these being finished up in lots of from twenty-five to fifty of a kind; many of the parts are made up by hundreds at a time. As the best drawn steel pinions to be found in the market have proved to be of insufficient exactness to make a perfect rack and pinion movement, all the pinions and racks used here in the manufacture of microscopes are cut by fine machinery, specially adapted to this work. To secure perfect smoothness in motion, each rack and pinion is "ground in." The making and adjustment of the rack and pinion is one of the most vital points of a microscope; indeed, it is an art of itself.

Engineering instruments are made here in large quantities. Transits are generally made in lots of 25, levels in lots of about 75. By carrying on the manufacture of instruments in large lots, the quality of the work is not only kept up to a high standard, but the workmen acquire such dexterity as to greatly reduce the cost of labor on these instruments.

The machinery used in the shops has been purchased, so far as it is possible to purchase machinery adapted to this kind of work, but a large number of special tools and appliances have been made in the shop which are adapted to this particular line of manufacture only.

To secure the quality of brass and bronze castings required in the manufacture of the instruments, it was found necessary to add a brass foundry. Phosphor bronze and aluminum bronze enter largely into the manufacture of many of the engineering and physical instruments.

Among the instruments and apparatus being made we will mention air pumps, induction coils, separable induction coils, Holtz machines, gyroscopes, drawing and mathematical instruments, and instruments for electrical measurements. It is a mistake to suppose that all of these instruments are designed only for institutions of learning. A large proportion of them are specially designed for practical, every day use in connection with regular manufactures and electric lighting.

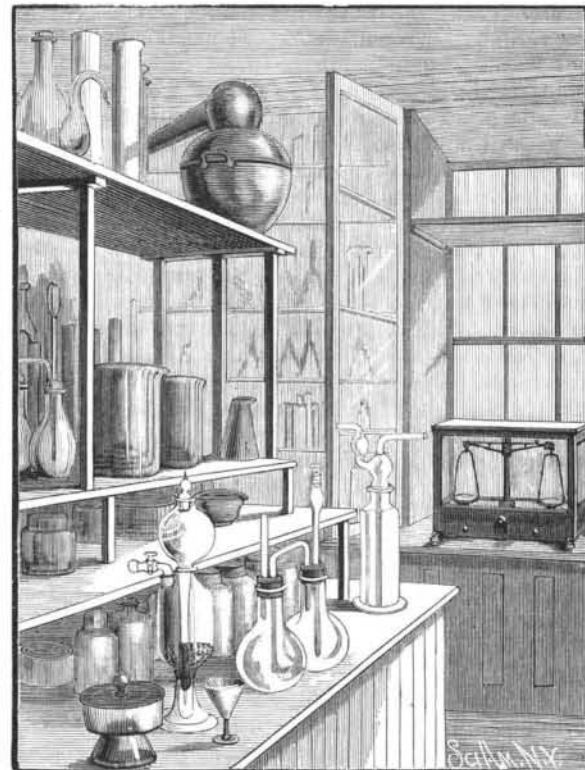
Much of the apparatus is of new and original design. One of the figures of the engraving shows the designing department, in which the drawings are executed for

the construction of scientific instruments regularly made in the establishment, as well as for work done to order.

The work done in the designing department covers almost every kind of apparatus for the illustration of the laws of physics and chemistry in their various branches. The designing of such instruments requires not only great mechanical ability, but also a thorough knowledge of the laws which the instruments are intended to illustrate, and must therefore be carried on by men of education and special talent. The manufacture of such special instruments in the workshops also gives to the men employed on such work a faculty for grasping new ideas and carrying them out which is not to be found where the men work in regular lines, making only the specialties to which they are accustomed. The instruments manufactured by this firm from their own designs are greatly varied, covering those for the illustration of the laws of mechanics, hydrostatics, pneumatics, acoustics, optics, heat, electricity, in short, the whole range of physics, as well as much in chemistry. The apparatus sold by

this firm is furnished not only to all parts of the United States, but they have constant demand for goods to go to Canada, Mexico, the South American states, China, Corea, Japan, and the Pacific islands. The cause for this may be found in the fact that they are of such general interest, embracing as they do appliances for all the arts and industries, for the physician and specialist, for the laboratory and observatory, for the workshop and the railroad, for the scientific investigator and experimentalist, as well as the mechanic and the farmer.

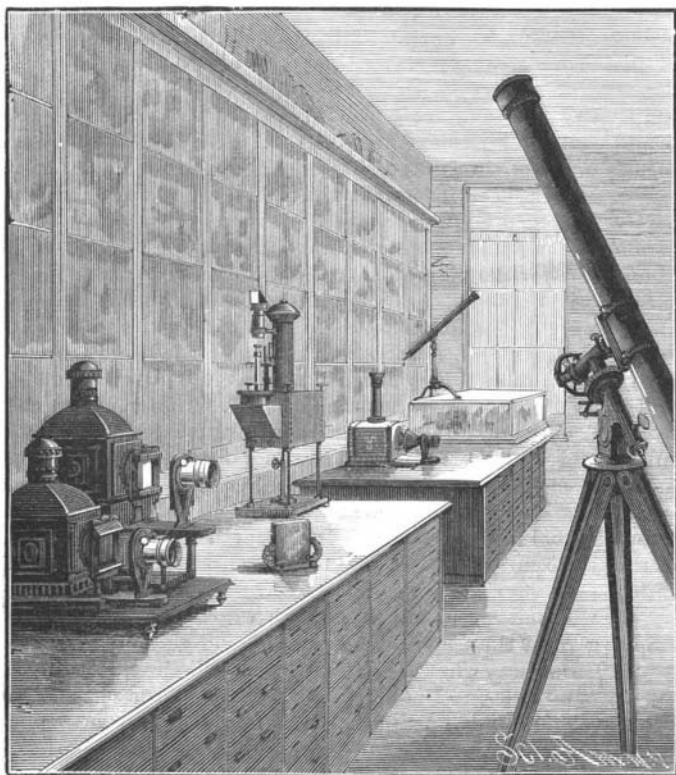
While all the apparatus might come under the general heads of physics and chemistry, there is a special department (No. 4) devoted to these sciences with their various branches, as exemplified in apparatus for research and for practical use. Under this head comes the department for electrical instruments, galvanometers, bridges, resistance coils, reading telescopes, ammeters, voltmeters, and similar instruments, which include those for the most careful research, as well as for the use of the practical electrician in the dynamo room.

**CHEMICAL APPARATUS.**

This particular branch of the business has grown to very large proportions within the last few years, and is now very complete.

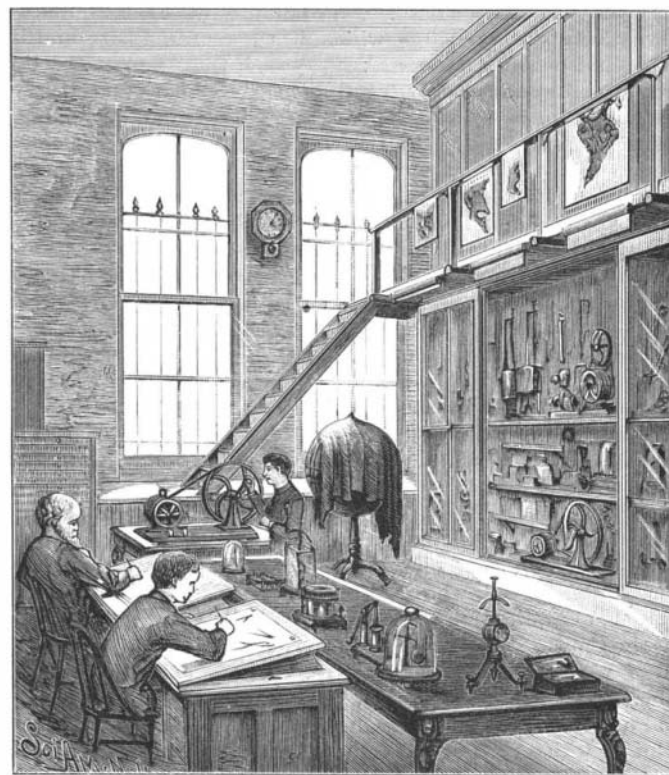
The sale of ammeters and voltmeters, both for scientific measurements and for practical work, is one of the specialties which has assumed large proportions, and they sell to universities, electric lighting companies, users of batteries, dynamo machines, in short to all of those industries where the ammeter and voltmeter have become as necessary as the steam gauge. It is perhaps well to mention that Queen & Co. are sole agents for the popular and well known Ayton & Perry instruments for electrical measurements.

Under the head of physics and chemistry is included another department, comprising anatomical and botanical models in plaster of Paris and papier mache. This branch includes a large and fine collection of mani-

**LANTERN AND TELESCOPE DEPARTMENT.**

manufacture of such instruments has reached proportions which can hardly be appreciated without a visit to the shops.

One of our illustrations gives a truthful representation of the place wherein are made scientific instruments in such great variety as to render it impossible for us to even enumerate them. We may, however, mention a few of the leading articles. A great deal of work for the government is done in this place. The apparatus for the Signal Service is largely furnished by Queen &

**DESIGNING DEPARTMENT.**

kins and models of different physiological subjects from well known European makers. They also include some entirely new and beautiful botanical models. Some of the novelties of this department are the models in gelatine of budding yeast, after Koch, and of other low forms of life, bacilli, etc., which represent the subjects as they appear when magnified 25,000 diameters.

Among the most interesting things in the department of physics are the new forms of polariscopes for



the table and for projection, and the exquisite specimens arranged to be used with these instruments.

The new form of Toepler-Holtz machine made in this establishment deserves more than a passing notice. It generates electricity in all weathers, is always ready for immediate use, and yields torrents of sparks.

In this department we also notice a new air pump, which gives a vacuum of 99%.

In this department may also be found a large collection of instruments for very accurate measurements. Among these are the standard meters, such as are used at the Bureau of Weights and Measures at Sevres, comparators, dividing engines, cathetometers, micrometers, spherometers, and other instruments of precision of the highest class.

In the chemical department a specialty is made of the importation of balances for all purposes, including very fine analytical balances, some of them sensible to the twentieth of a milligramme. The stock of chemical glassware, pure chemicals for technical work, platinum, etc., is large and complete.

In the department of engineering are found transits for railroad engineers, city work and general surveying, engineers' and architects' levelers, plane tables, surveyors' compasses, leveling rods, chains, and all other instruments required to complete the outfit of the engineer, either for reconnaissance or for the final work of laying out the line of a railway or boring a tunnel. We are informed that these instruments are sent to every part of the world. In this department are also made the elaborate and costly instruments of precision used principally by the United States government, such as standard comparators for the testing room in the United States Signal Service, standard ruling and engraving machines for the United States hydrographic office, the instruments of precision for the engineer corps, etc. The firm, besides being large manufacturers of engineering and drawing instruments, are large importers of these articles, as well as the stationery and other materials required by draughtsmen and engineers.

The ophthalmic department, which is known as department No. 1, embraces all the apparatus and appliances used for the examination of the eye, and includes spectacles, eyeglasses, opera glasses, etc. It is one of the largest branches of the business. The lens-grinding room, a part of which is shown in one of the engravings, is devoted almost exclusively to making what are known as "prescription glasses," which are required to be ground specially to order. This department is particularly interesting, as here the process of making lenses can be traced from beginning to end. The number of prescriptions which come in daily through the mails and otherwise from all parts of the country indicates the importance of this branch of the business. It is surprising to note the variety of defects in the eye which are corrected by special glasses. These prescriptions are prepared from measurements. The old way of fitting the eye by trial is now almost discarded. In this department are made ophthalmoscopes, by means of which the interior of the eye is illuminated and examined by the physician. In this department are also made other ophthalmological apparatus, such as perimeters, trial frames, test cases, prisms, etc.

In the department known as No. 5 may be found astronomical instruments and apparatus for projection. The astronomical branch comprises refracting and reflecting telescopes, the stands and other accessories required for practical observation; microscopes, helioscopes, spectrum attachments, eye pieces, etc., transits, sidereal clocks and chronographs, which are particularly designed for schools and colleges. In the branch devoted to projection there are various forms of lanterns, which are known under the names of sciopicons, stereopticons, college lanterns, for entertainment as well as for instruction. Some of these lanterns are provided with powerful petroleum lamps of new design, which compare favorably with other illuminators. As might be expected in an establishment like this, a large stock of pictures for use with the lanterns, embracing educational views, diagrams, and

pictures of various physical apparatus, are kept on hand.

The photographic department, although a comparatively new one, shows all the spirit and enterprise which characterizes this establishment, having within five years introduced many articles of value to photographers, the most important of which are the well known Queen-Francais photographic lenses, indorsed by the highest authorities, and the Queen pantagraph lenses, which are designed to supply a lens of good quality at a reasonable price.

This department has also commenced the publication of a magazine entitled "Science of Photography," which is full of interest and covers a wide range of subjects.

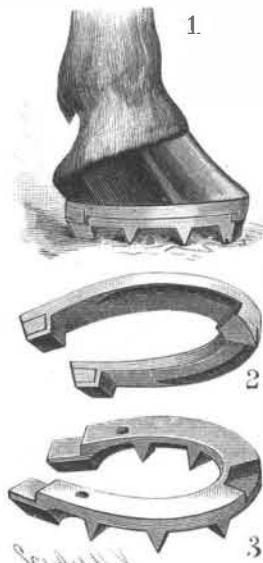
It is impossible to fitly describe in detail all the departments of a great establishment like this. Each department is a little world in itself, covering many branches, each of which in turn includes many sub-branches, so that it would require volumes to adequately describe everything that may be seen at the store and wareroom.

Any one desiring further information than we have been able to give, can readily obtain it by securing one or more of the large number of catalogues published by this house, relative to the different departments.

The firm, in addition to the catalogues of their own productions, make a specialty of securing catalogues of all foreign makers of apparatus in different branches of science, and of keeping informed as to the scientific and practical knowledge and apparatus of the day, so that they may properly be considered a bureau of information for those who choose to avail themselves of its advantages.

#### AN IMPROVED HORSESHOE.

A horseshoe which is designed to combine the advantages of a smooth or a flat calk shoe and a sharp calk shoe has been patented by Mr. Israel G. Howell, of Hopewell, N. J., and is illustrated herewith.



HOWELL'S HORSESHOE.

The shoe proper, or main shoe, to be attached with nails in the usual way to the horse's hoof, is shown in Fig. 2, a supplemental or over shoe being shown in Fig. 3, and being adapted to be attached to and detached from the main shoe. The supplemental shoe has on its inner side flat surfaces corresponding with the flat surfaces of the main shoe, and it has recesses, one in its forward end and one at each of its rear ends, corresponding with the wedge-shaped and dovetailed toe calk and the heel calks of the main shoe. The supplemental shoe has sharp or pointed calks on its bottom, and is adapted to be secured to the main shoe by screws passed through suitable screw holes provided therefor. By this invention a shoe having one or the other forms of calks may be readily fitted without the necessity of withdrawing nails from the hoof and renailing, and the changing may be performed by unskilled persons.

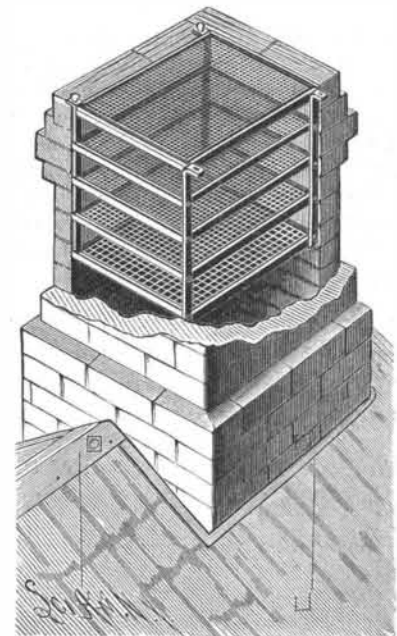
#### AN IMPROVED ELECTRICAL SPEED INDICATOR.

A simple device by which the increase or diminution of speed in machinery above or below its normal rate may be indicated electrically, is illustrated herewith, and has been patented by Mr. Frederick W. Schlepegrell, of No. 20 Ashton Street, Charleston, S. C. The indicator shaft, arranged to receive motion conveniently from the machine whose speed is to be indicated, is formed of two parts connected together by an insulating sleeve, and is journaled in a frame whose upper and lower parts are also connected by a threaded insulating sleeve, binding posts, connected with an electric bell or alarm, being secured to the lower and upper parts of the frame. In grooves on opposite sides of the indicator shaft are secured flat springs, with a weight, preferably of spherical form, on the outer extremity of each spring, a nut being fitted to move up or down on the shaft to vary the length of the free ends of the spring arms. The weights are adjusted relative to the motion of the indicator shaft when driven by a machine, so that when the machine runs at its normal speed the weights will revolve in a position between the upper part of the shaft and the contact screws on either side, the variation in the throw of the spring arms being indicated by the dotted lines. When the speed of the machine increases so that the weights touch the contact screws, the circuit is completed and an alarm is given, a like effect being also produced when the machine runs slower than its normal speed, or when it stops, as the weights are then brought into contact with the upper part of the indicator shaft, thus completing the circuit. The indi-

cator may be adjusted to adapt it to higher or lower speeds by turning the nut on the lower portion of the indicator shaft, thus shortening or lengthening the spring arms, and also by turning the contact screws in or out.

#### AN IMPROVED SPARK ARRESTER.

A device adapted for application to chimneys, stove pipes, and smoke stacks, to prevent sparks and cinders

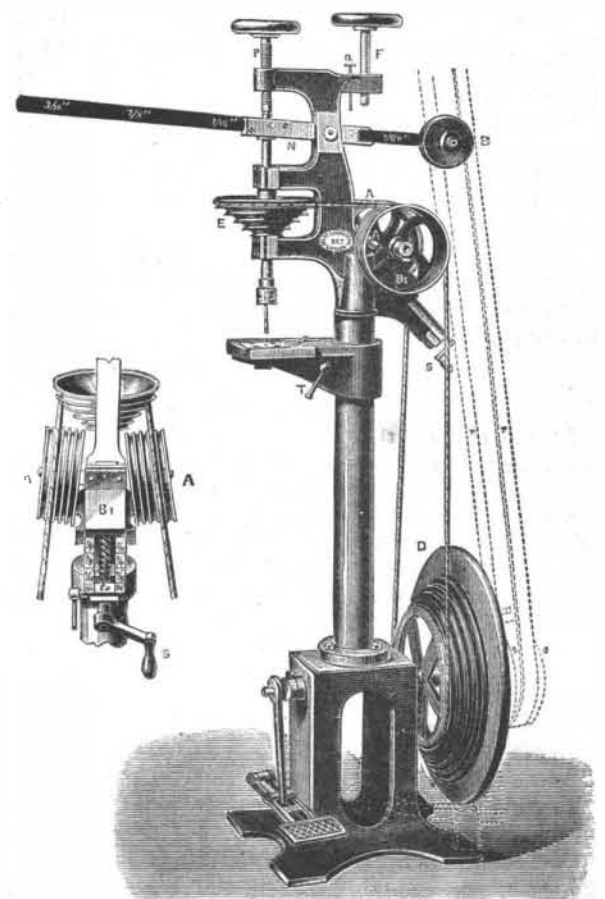


BRUHN & RAUM'S SPARK ARRESTER.

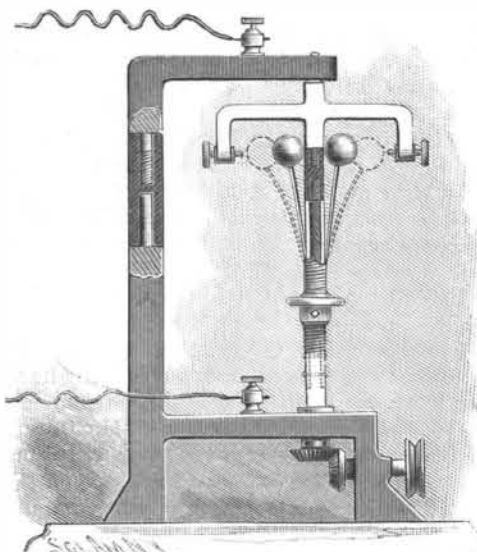
from passing out, and whereby they will be thrown downward to the base of the chimney, is illustrated herewith, and has been patented by Messrs. Frederick Bruhn and Jerome Raum, of Fort Shaw, Montana Ter. Two or more, but preferably five, frames are made of double strap iron, of a size equal to the inner dimensions of the chimney stack or pipe, and across the top of each frame wire netting is stretched, the ends of the netting being carried down in a space between the opposing members of the frame. The screens are made of very thin wire, the meshes of one screen being very fine and the meshes of the others increasing in size, the screens being retained in horizontal position one above the other, about four inches apart, by their attachment at each corner to vertical rods. With this arrangement any sparks or cinders passing through the bottom screen are checked at the upper one and deflected downward to the base of the chimney. In placing the series of screens in a chimney they are manipulated by means of knobs on the vertical rods, and are supported by projections from the rods resting on the top of the chimney. This spark arrester can be readily taken apart and put up in a very small space for shipment, and can be manufactured very economically.

#### IMPROVED DRILLING MACHINE.

We illustrate a handy drilling machine, capable of being driven either by foot or power, which we find in *Engineering*. The driving band runs from a large cone



HIGH SPEED DRILLING MACHINE.



SCHLEPEGRELL'S ELECTRICAL SPEED INDICATOR.