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 99¾.

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, eye glasses, 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 sciopticons, 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 physic l apparatus, are kept on hand.

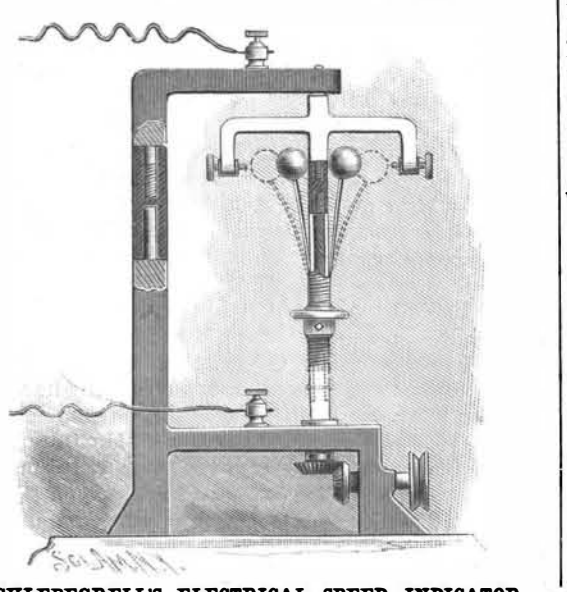
The photographic department, although a comparatively new one, shows all the spirit and enterprise which characterizes this establishment, having within five years introduced many articles of value to photographers, the most important of which are the well known Queen-Francais photographic lenses, indorsed 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 subbranches, 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.

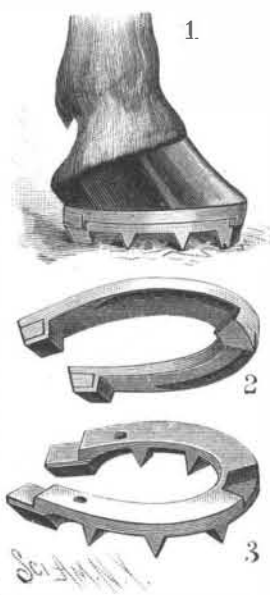
The firm, in addition to the catalogues of their own productions, make a specialty of securing catalogues of all foreign makers of apparatus in different branches of science, and of keeping informed as to the scientific and practical knowledge and apparatus of the day, so that they may properly be considered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



SCHLEPEGRELL'S ELECTRICAL SPEED INDICATOR.

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. 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.



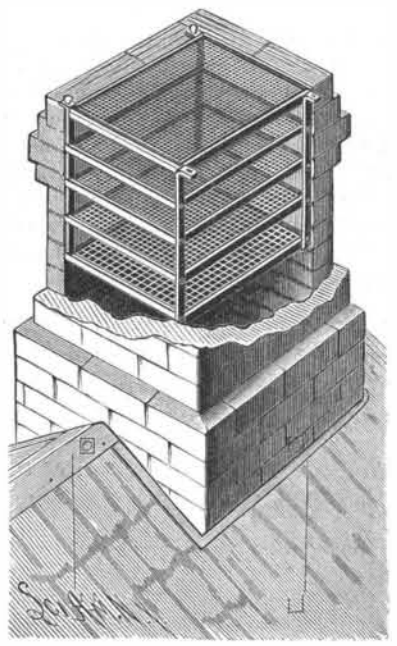
HOWELL'S HORSESHOE.

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 indicator 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.

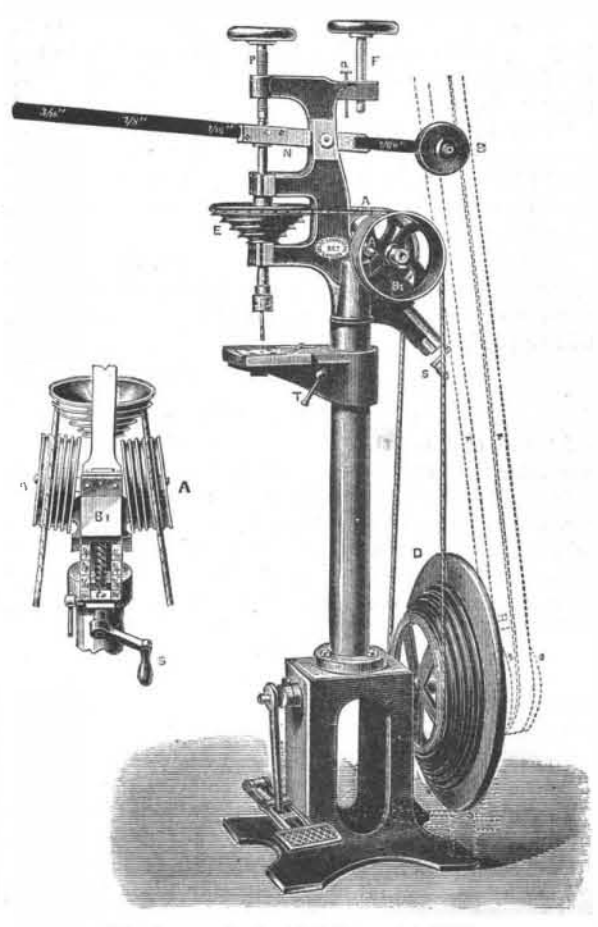
A device adapted for application to chimneys, stove pipes, and smoke stacks, to prevent sparks and cinders from passing out, and whereby they will be thrown downward to the base of the chimney, is illustrated herewith, and has been patented by Messrs. Frederick Bruhn and Jerome Raum, of Fort Shaw, Montana 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.



BRUHN & RAUM'S SPARK ARRESTER.

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.

pulley, D, on the main shaft round a pair of guide pulleys, A, to a cone pulley, E, on the drill spindle. The arrangement of the guide pulleys is novel. They are mounted on an inclined slide, along which they can be moved by a screw, and they are so arranged on this slide that as they move lengthwise they are tilted sideways, so as always to present a fair lead to and from the particular step of the main pulley which they may be opposite. Each guide pulley has five grooves, corresponding to the five steps of the cone on the drill spindle (see detached view), and the angle of the slide is such that the band is kept uniformly tight.

There are three different methods of feeding the drill. It may be forced down by the screw, P, or by applying the hand to the lever, N, or the counterweight, B, may be transferred to the other end of the lever and the feed be controlled by withdrawing the screw, F. By means of the stop screw, *a*, any number of holes may be drilled exactly to the same depth.

The machine is provided with a treadle, but fast and loose pulleys can be fitted to it, as shown in dotted lines.

Practical Uses of the Electro-Magnet.

The following description of the practical employment of the electro-magnet is taken from the Pittsburg *Press:*

"S. T. Wellman, the superintendent of the big steel works at Cleveland, conceived the notion some time ago that a large electro-magnet, suspended by a chain from a crane, could be employed very profitably for lifting masses of iron. Not being an electrician, he did not see his way to carrying the thing out practically. Mr. Berry, an electrical engineer of Pittsburg, being on the spot, volunteered his advice and superintendence. Together they brought the thing to completion, and it is now working with great perfection.

"For the construction of the electro-magnet to be experimented with, two bars of soft iron were taken, each being fourteen inches long and three inches in diameter. They were wrapped with a multitude of strands of No. 14 B. & S. gauge covered wire. To combine the two separate magnets thus formed into one, they were linked together on top by a third soft iron bar, square in the cross section.

"For trial of the magnet at portative work it was suspended by a rope from a pneumatic crane. Rope was used, as it was found that a chain became magnetized and did not act very well. The current power sent through the wire to induce the magnetism was that of 5½ to 6 amperes. It was found that a weight of 800 pounds could be lifted up handily, and, by shutting off the current and lowering the magnet, deposited anywhere very easily. . . . At one part of the factory where this electro-magnet has been put up, fourteen or fifteen Polacks have been wont to be kept employed at this work. They are now in the position of Othello in the matter of occupation, the magnet picking up two or three billets at a time and depositing them in a car.

"If the thing works permanently, as it appeared to be working when Mr. Berry left Cleveland, it looks as if one boy would be able to do the work of a gang of men. His duties will be those of lowering the magnet from the crane on to some billets, turning on the current, swinging the magnet around to the top of a car, cutting off the current, and bringing the crane back to its first position. The crane used is one of a very superior class, being adapted to turning in any possible direction almost, at a slight movement from a pneumatic valve.

"The turning off and on the electric switch, of course, would require no expenditure of energy that would be worth speaking of at all. It is intended to construct an electro-magnet of softer and more appropriate iron than that of which the first experimental one was made. The amount of current, also, will be arranged so that only a portative capacity of 150 pounds or so, at the poles of the combined magnet, will be produced."

Parasites on Live Stock.

At the end of the winter, colts, calves, and older stock are very apt to be crowded with these objectionable parasites. They thrive best upon poor animals, and are supposed to be bred by old, worn out, and miserable creatures. However this may be, there is no doubt that they find a suitable home in the dirty matted hair in the late winter or early spring months, and on a sunny day may be seen literally in millions, every hair having nits upon it. One reason of so much rubbish accompanying them is that in the course of their development from the egg to the mature louse the skin is cast several times.

To get rid of them is not always easy, as the length of coat and accumulation of dandruff or scurf makes a waterproof covering that resists many remedies which in themselves are certain destroyers if only brought into contact with the parasites.

A sunny day should be chosen, and the early part of it, when a bountiful washing with soft soap and hot water should be undertaken, so as to clear the skin of grease and dirt before applying the remedy. Staves-acre is an effectual destroyer of lice if prepared by boiling ½ pound with a gallon of water and brushing well into the coat with a hard brush.

Tobacco juice is also much in request for the purpose, and can be procured from druggists at a very low rate, as it is imported now free of duty, or only a nominal duty, and the old expensive plan of boiling or infusing good shag tobacco is not necessary. By the way, very few people avail themselves of the governmental privileges of growing sufficient tobacco for this and fumigating purposes, though they might easily do so.

Paraffin is sometimes used, but is a very dangerous remedy, occasionally being absorbed and causing the death of the animal, and not unfrequently causing a blister, and much unnecessary pain, and subsequent blemish.

There is another kind of louse from which horses suffer, which, if once seen, can never be forgotten—we refer to poultry lousiness. It will sometimes happen that a horse stabled with fowls will become affected and literally tear himself to pieces with them unless promptly treated with one of the foregoing remedies, either of which is as effectual against these as against the ordinary louse.

In washing or applying any remedy, it should always be commenced near the eyes and worked backward, as if any other plan is adopted the besieged retreat into the mane and ears, and many escape altogether, like the rats that are left just to keep up the breed after the rat catcher has gone.

It is always well to repeat the dressing and keep the animals moving about till dry, or they may lick off more lotion than is good for them, or stand about and get chilled.—*Chemist and Druggist.*

A DEVICE FOR PROTECTING GARMENTS.

The vest protector shown herewith has been patented by Mr. Benjamin Ives, of St. Paul, Minn. It is an apron of felt or other suitable material, having a binding on its upper edge, in which, near opposite edges of the apron, are formed holes for receiving an S-shaped hook, by which the protector may be supported from the edges of the vest pockets, for protecting garments against wear by contact with the edges of desks and counters.

IVES' VEST PROTECTOR.

Dynamite—Its Uses and How to Handle It.

Although dynamite has been in use for considerable time, from the number of inquiries from every part of the globe relative to its ingredients, its explosive force, and how to handle it with safety, we conclude but few comparatively know but little about it. The following, from the *Indian Engineer*, published at Calcutta, gives the information which many are seeking to know.

Dynamite consists of some porous absorbent mineral saturated with nitro-glycerine. Several substances have been tried as absorbents of the glycerine, but the most satisfactory is the *kieselguhr*, an infusorial earth, composed of the silicious shells of extremely small vegetable organisms, and it is of this that Nobel's dynamite is made. It absorbs about three times its weight of the glycerine, and resembles putty in appearance. Thus, a given quantity will contain 75 per cent of the real explosive, and its blasting power compared with pure nitro-glycerine is, of course, represented by the same ratio. In order to explode it, it is necessary to obtain the temperature of 360° Fahrenheit. It freezes in the same way as glycerine, and when in this state must be carefully handled. Nitro-glycerine has an expansive force ten times that of an equal weight of powder. It is highly dangerous to place dynamite on or near fire stoves, steam pipes, or any highly heated metal. Dynamite must never be put into warm water to thaw it, as the water would free the nitro-glycerine, when it is most dangerous. It ought always to be put into a water-tight vessel, and then have the vessel put into warm water. It should never be exposed to the direct rays of a tropical sun. When loading it, a wooden rod or squeezer should be used to push home the cartridge, *never a metal one*, and the charge should gently and firmly be pushed down, and not rammed or pounded.

If dynamite has to be loaded into tins, avoid smelling it, as it gives a sickly, nervous headache for several days. Never squeeze the primer containing the detonator, but lower or push it gently till it rests on the charge. For tampings, and or water should be used. In the event of a misfire, never attempt to draw the tamping. If water tamping has been used, put a fresh primer and detonator on top of the charge. If other than water tamping has been used, bore a fresh hole. The detonator must be very carefully handled. If one exploded in the hand, the hand would be shattered. When putting in the fuse, cut off the end of it square, and put it in firmly, but gently. Dynamite can be burnt with safety, and simply fizzes up harmlessly. It exercises its force in the direction of most resistance. A single cartridge attached to a rail will break it; a 4 oz. cartridge will break a 35 lb. railway rail in two. The charge varies from a few cartridges to as much as may be necessary.

Dynamite is generally packed up in dealwood boxes containing 50 lb. Each box contains five separate packages of 10 lb., and in the package ½ oz. and 2 oz. cartridges are mixed. They are all the same power, but the ½ oz. cartridges are called primers, and used for exploding charges. The detonators are long copper caps, filled with a heavy charge of chloride of mercury. They must be kept quite dry, and always separate from the dynamite. It is sold in boxes of 200 caps. The fuse used is of various sorts. The most useful is the black fuse sold in coils of 24 feet. It burns at the rate of a yard a minute.

A School for Fire Horses.

At 58 Lawrence Street, Harlem, is the famous training school for all the fine, intelligent horses of the New York Fire Department. Here, says the New York *World*, the green horses are brought and trained to jump from their stalls at the first sound of the alarm gong and rush out to their stations, where they stand ready for the lightning-like adjustment of the harness, and quivering with impatience for the great doors to be thrown back, that they may whirl the ponderous engine or hose carriage out into the street. Veterinary surgeon Joseph Shea, who ranks as a captain in the department, is in command of this equine kindergarten, and is ably assisted by Foreman Lawrence Murphy, Firemen Patrick Haley and Thomas Clark.

About sixty perfectly trained horses are turned out from this school yearly. Captain Shea does not attend to the training as much as to the buying and matching of the animals. He goes at regular intervals to Bull's Head, buys those horses that his judgment tells him are what he requires, and, sending them to the school, leaves them in the hands of Foreman Murphy and his two assistants. It astonishes one to find how rapidly this training is accomplished. The average horse understands his new duties pretty thoroughly at the end of two days, and the least intelligent of them never takes longer than a week to learn the ropes. After thoroughly testing the green animal to find if his "wind" is in perfect condition, he is put in a stall and led backward and forward to his station before the engine some dozen times or so to accustom him to ducking his head to get under the collar and harness. Then he is left in his stall and coaxed to come forward under the harness himself by kind words and rewards of candy and apples. He is then taught to come forward at the clang of the gong, and after a little practice at this his education is complete, and he is transferred to one of the regular fire houses.

The system of training here is entirely that of kindness, and recourse to the whip is never necessary. The horses seem to like the work, and grow as enthusiastic over it as one of the old volunteer firemen. Of course horses that do this kind of work have to be both strong and speedy. Three hundred dollars is the average price paid for them, and they must be between sixteen and sixteen and one half hands high, weigh from 1,200 to 1,450 pounds, and be from four to six years old. Their usual length of active service is about five years. They are then auctioned off, and bring from $50 to $150.

This institution is also a kind of "hors-pital," and the fire horses that fall ill with distemper, or pinkeye, or become lame, are sent here to be nursed back to health. Captain Shea is fond of perfectly mated teams, and takes a great deal of extra trouble in transferring horses from one station to another, in order that, as nearly as is possible, every team in the department may be perfectly matched in size, appearance, and working qualities. The old chemical fire engines are used in the school for the horses to practice running with, and four of them have been racked to pieces since the establishment of this institution, March 23, 1882. The one now in use is the old Morrisania engine, and it looks as if it were on its last legs, or, more correctly speaking, on its last wheels.

This school was started merely as an experiment, and as such was provided with what was thought to be temporary quarters in an old engine house. It has proved a big success, but nothing has been done to improve the accommodations. The building is too small for the amount of work done there, and is in need of repairs. The general opinion of the firemen is that there should be nearly double the number of teachers there, and accommodations for twenty instead of seven horses, so that in the spring, when the going is always heavy and many horses ill from the hard work of the winter, there would be absolutely no danger of running short of trained animals. M. Surat, who came from France some years ago to study the methods of the New York Fire Department, was particularly struck with the equine training school, and when Chief Gicquel and President Purroy visited France a year, ago they saw in Paris a school on exactly the plan of this one, but fitted up more completely.