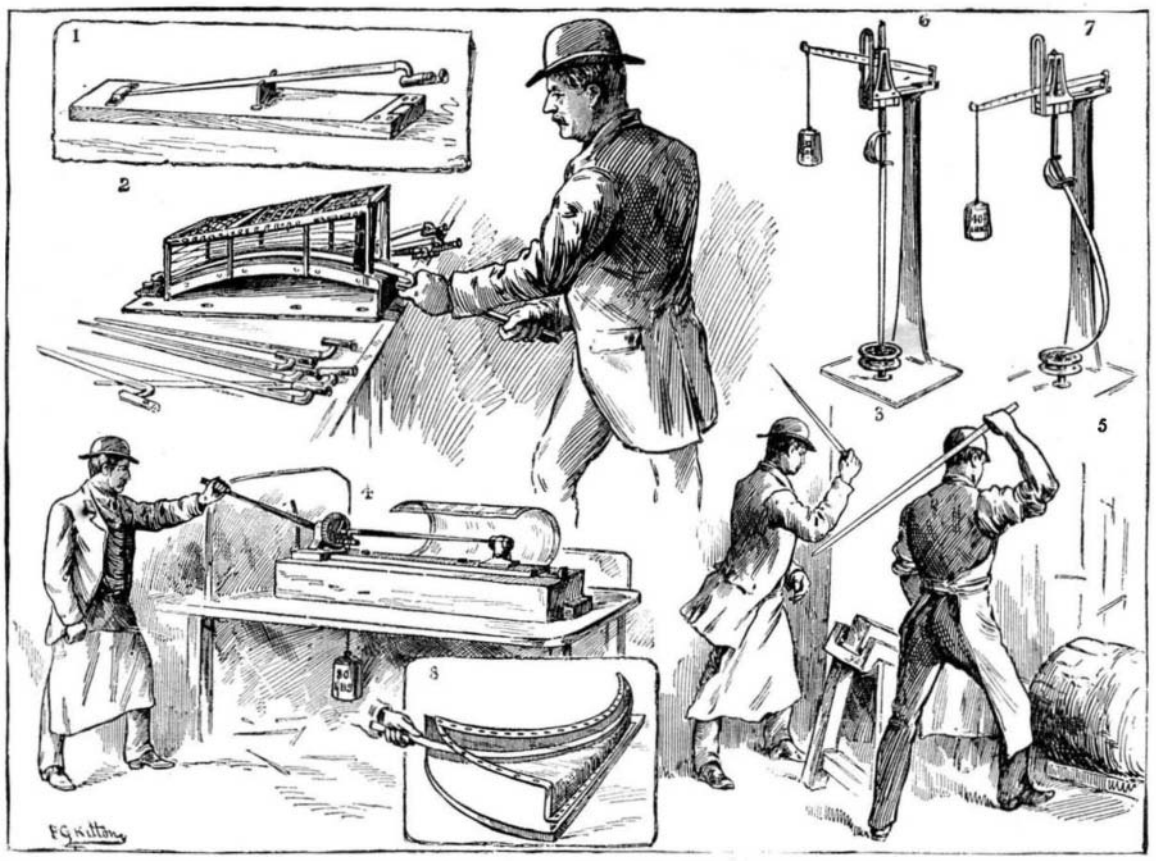
TESTING BAYONETS AND CAVALRY SWORDS.

Previous to the year 1885, the long triangular Martini-Henry bayonet was tested by being sprung over a bridge two inches high, as depicted in our sketch (No. 1). The point of the bayonet was held in a shoe, the center of the blade rested on the bridge; the socket was then pressed down till it was level with the point. The bayonet had to stand this test without receiving a permanent "set." This test was considered sufficient till the campaign in the Soudan showed the necessity for a more severe test. The bayonet now, instead of being sprung over a bridge, is bent down over a curved block of wood (Fig. 2), on all three sides, which tests every part of the blade from point to shoulder; if it stands this without receiving a "set," it is then struck two or three times on each face on a solid wood block (Fig. 3); this is with the object of testing the temper and quality of metal, and for detecting flaws. If the bayonet stands this test, it is finally subjected to the twisting test (Fig. 4). In this the socket is placed in a revolving disk with a weight of 80 pounds attached to it, the point being held stationary; the bayonet is twisted through an arc of a quarter of a circle, and on being released must recover its figure.

Cavalry Sword, Pattern 1885.—The tests for this sword are also extremely severe (Fig. 5). The blade is first struck on back and edge on a solid oak block to detect flaws. The rigidity of the blade is then tested by placing it in a machine (Fig. 6), and bringing a weight pressure on it of 32 pounds; it must support this weight without deviating from the straight line. Its elasticity is next tested in the same machine (Fig. 7). A weight pressure of 40 pounds is applied, depressing the hilt six inches, as shown in the sketch. On the weight being released, the blade has to recover itself; the blade is then finally tested round a curved block of wood (Fig. 8), on both sides. After all these tests the blade should remain absolutely straight, without having received a permanent set. If it is set in the smallest degree, it is cast out. From the above brief description, it will be seen that it is almost, if not quite, impossible for either a cavalry sword or a triagular bayonet which is either too soft or too hard to be passed into the service.—*London Graphic.*



1. The "Bridge" Test (old style) for Triangular Bayonets.
2. The "Curve" Test (the method adopted during the past two years).
3. The "Striking" Test for Bayonets.
4. The "Twisting" Test for Bayonets.
5. The "Striking" Test for Cavalry Sword Blades.
6. The "Vertical Pressure" Test for Cavalry Swords. (A weight of 32 lb. must not deflect the blade.)
7. The "Vertical Pressure" Test. (A weight of 40 lb. must shorten the blade by six inches without breaking it.)
8. The "Curve" Test for Sword Blades.

TESTING BAYONETS AND CAVALRY SWORDS AT THE ROYAL SMALL ARMS FACTORY ENFIELD.

SCREW CUTTING AND SELF-ACTING SLIDING GAP LATHE.

We give an illustration from *Engineering* of a screw cutting and self-acting sliding gap lathe, constructed by Messrs. John Lang & Sons, Johnstone, Eng. The fast headstock is 6 ft. long and is in one casting to the ground line, where it is securely bolted to the gap frame. The head is 6 ft. 6 in. wide at the base, and is carefully designed to resist the various strains to which it is subject. The spindle is of steel and has a front journal 10 in. in diameter by 15 in. long.

The cones on the spindle and counter gear are turned inside as well as outside, so as to be properly balanced. The largest step of the cone is 3 ft. 6 in. in diameter, and the smallest step is 22 in. in diameter. The face plate is 9 ft. in diameter, with an internal wheel cast on the back. The gap frame is of massive proportions, and is arranged to swing 15 ft. in diameter and 4 ft. clear of the face plate in front. The bed is 20 ft. long, 4 ft. broad, and 20 in. deep, and is arranged to slide from 12 in. to 6½ ft. from face plate. The leading screw is of steel, and is 4½ in. in diameter; it is accurately cut to Whitworth standard thread. The motion for driving the leading screw for general work up to 10. ft. diameter is communicated through the shaft crossing the gap frame; but when the work is over 10 ft. in diameter, the motion is carried around the end of the gap frame by shafts with bevel gearing, the shaft crossing the gap being then withdrawn.

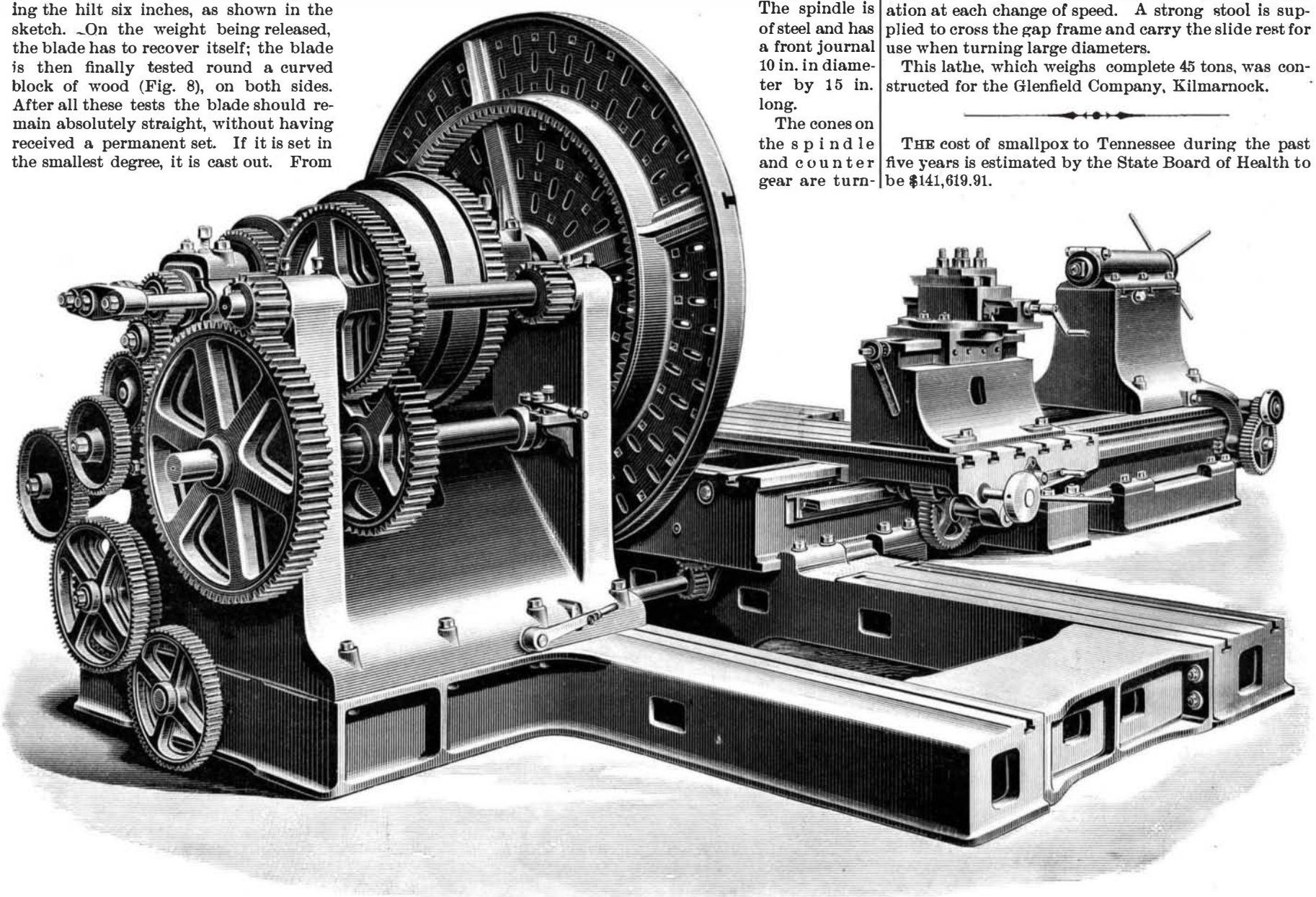
The shifting headstock is fixed in alignment with the running head by sliding in T-slots planed out of the bed, and having V-lips in which the headstock is fitted. Four bolts from these T-slots secure the headstock in position when turning.

All the gearing of the lathe is carefully designed and of ample strength for heavy duty; the arms wheels are all of the box pattern, and all teeth of the wheels, including the change gears, are machine cut from solid lanks, so as to give smoothness and steadiness of cut, with little or no backlash, and the nearest possible approach to noiselessness of action.

The internal wheel on the back of the face plate, and the bevel feed motion, are cast from machine cut patterns, having a correct form of tooth. The gearing is proportioned so as to give an equal percentage of variation at each change of speed. A strong stool is supplied to cross the gap frame and carry the slide rest for use when turning large diameters.

This lathe, which weighs complete 45 tons, was constructed for the Glenfield Company, Kilmarnock.

THE cost of smallpox to Tennessee during the past five years is estimated by the State Board of Health to be $141,619.91.



IMPROVED SCREW CUTTING AND AUTOMATIC SLIDING GAP LATHE.

Longevity of Butterflies.

A correspondent of the *Times*, referring to Sir John Lubbock's discovery of much greater longevity of ants than has hitherto been believed, thinks that the same may be true with regard to the butterfly, although the common notion is that the butterfly's life is a short and merry one. The correspondent, who writes from Bournemouth, then relates the following incident:

"On August 15 last a fine peacock butterfly flew into our house through the garden door, and was caught and put under a large bell glass. On the following day another came in, and was also put under the glass. They were supplied daily with fresh flowers and a few drops of new honey, which they evidently much enjoyed. No. 1 died during a suddenly cold night; No. 2 lived until yesterday, December 14. Whenever the sun shone upon their cage, which was placed on a table near a large window of plate glass, they opened their beautiful wings and flew about vigorously, occasionally resting on a flower to thrust their trunks deeply into its corolla, or standing over and sucking up the drops of honey. The extraordinarily sensitive nervous system of these little beauties was indicated by the most rapid vibratile trembling of the wings directly the sunlight or the scent of fresh flowers reached them. When the sun was not out, they usually remained perfectly still, with their wings closed, especially selecting to hang on the under side of a leaf. They showed great intelligence in distinguishing the freshly gathered flowers and in deciding that honey was the right thing to eat, and I have seen one of them scramble with considerable difficulty across his cage through a tangle of leaves and stalks, determined to get to a particular leaf on which he wished to hang. After some unsuccessful attempts to reach it, he hooked it down with one foot, then held it with another, until he could get the rest of his legs upon it, having done which he appeared satisfied, shut up his wings, and hung himself upon it, topsy-turvy, to rest. If he failed to do what he wished with one leg, he immediately tried another, appearing to think that, having six at his disposal, it was foolish to waste much time on any one. But he only used his most anterior pair on very special occasions. How long each butterfly had lived before it was caught I do not know, but No. 2 lived in its glass cage 121 days."

Influence of Hot Drinks on Digestion.

Various opinions are held by the public, and we believe by medical men also, on the effect of hot drinks on the digestion of food. This matter has lately been investigated by Dr. V. E. Nyeshel, of St. Petersburg. The plan he adopted was to make use of twenty patients in the surgical wards of the Obukhoff Hospital, suffering from fracture of the fibula, contusion of the foot, and such like affections, and dividing them into two sets of ten each, to find out first, by a three days' experiment, the length of time an ordinary meal of soup, meat, potatoes, and black bread required for digestion. For this purpose the stomach tube was employed at periods varying from five to seven hours and a half after the meal, and the condition of the contents of the stomach examined. In all the cases complete breaking down appeared to have taken place in about six hours and a half. The exact time required by each individual for the digestion of the specified meal being noted, further observations were made on a subsequent day, the patients in the first group being given after the meal hot tea, at a temperature of from 40° to 75° C., the quantity taken varying from two to eight tumblerfuls. The contents of the stomach were drawn off at the time when, as former experiments had shown, digestion would, under ordinary c nditions, have been complete. The result was that, when not more than three tumblerfuls of hot tea had been swallowed, it was found that digestion had progressed just as well as without it, but a larger quantity of hot tea appeared distinctly to retard the digestive process. The second group of patients were given a meal similar to what they had had before, but hot. On examining the contents of their stomachs, no difference could be detected between the rate of digestion of hot and cold food. The author found that by painting the pharynx with a 5 per cent solution of hydrochlorate of cocaine the tube passed easily and quickly.—*Lancet.*

Extracting Teeth with the Pistol.

Old Dr. Monsey extracted teeth by fastening a strong piece of catgut securely to the tooth, to the opposite end of which he affixed a bullet. With this bullet and a full measure of powder, a pistol was charged, and when the trigger was pulled, the operation was performed effectually and speedily. Once a gentleman who had agreed to try the novelty, and had even allowed the apparatus to be adjusted, at the last moment exclaimed, "Stop, stop, I've changed my mind!" "But I haven't, and you're a fool and a coward for your pains," answered the Doctor, pulling the trigger. In another instant the tooth was extracted, much to the timid patient's delight and astonishment.

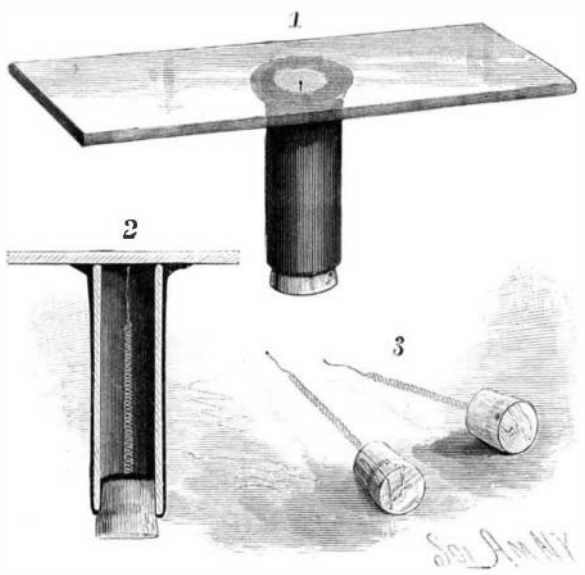
MICROSCOPIC OBSERVATION OF VIBRATING RODS.

BY GEO. M. HOPKINS.

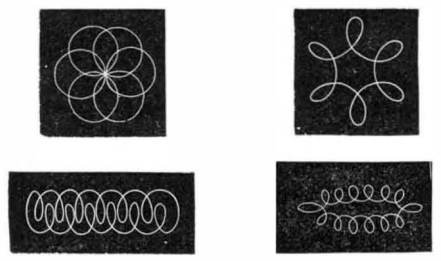
A metal rod fixed in a vise at one end, with a silvered glass bead attached to the other end, constitutes Sir Charles Wheatstone's apparatus for the study of the transverse vibrations of rods.

By vibrating a rod arranged in this way Wheatstone was enabled to obtain an almost infinite variety of symmetrical and beautiful luminous scrolls.

It is a simple matter to repeat Wheatstone's experiment with the apparatus alluded to, but it is not always convenient to do it.



VIBRATING ROD MOUNTED FOR MICROSCOPIC OBSERVATION.



CURVES TRACED BY VIBRATING ROD.

A vibrating rod permanently mounted in a cell and arranged for observation with a microscope is shown in the annexed engraving; Fig. 1 representing the mount in perspective, Fig. 2 showing it in section, Fig. 3 showing the rods detached from the mount.

To an ordinary 3 × 1 in. glass slip is connected a paper tube $\frac{6}{16}$ in. internal diameter and 1¼ in. long, well blackened on the inside.

The cement is applied carefully, so as to have the glass clean and clear within the tube. To a cork fitted to the open end of the tube is cemented a wire spiral formed of about 4 in. of No. 40 spring brass wire. The diameter of the spiral is $\frac{3}{16}$ in. The end of the spiral next the glass slip terminates in a straight arm ¼ in. long, upon the end of which there is a minute bead of black glass. A smooth bead is secured by first fusing borax on the end of the wire, then touching the borax while in a fused state with a thin thread of black glass, then breaking the thread a short distance from the end of the wire, and finally fusing it by gradually pushing it forward into the flame until a perfect bead of the required size is formed.

The cork with the spiral is inserted in the paper tube with the bead arranged centrally with reference to the tube, and only a very short distance below the glass.

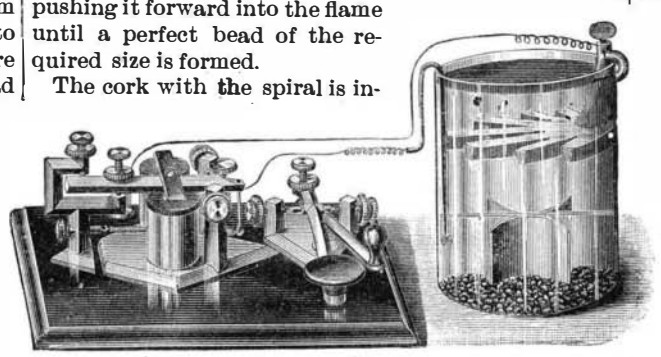
By placing the mount thus prepared under a 1 in. or 2 in. objective, and allowing light to fall on the bead from one direction, it will be noticed that the black glass bead is rarely at rest, the bright pencil of light reflected from it continually describing curves of various forms. Stepping on the floor of the room in which the microscope is located is generally sufficient to set the spiral into active vibration.

Rapping on the table on which the microscope rests will cause the bead to describe intricate curves.

By striking the side of the paper tube with more or less force, different figures will be produced.

Illuminating the bead from two points produces parallel curves.

While this mount is perhaps not strictly a microscopic object, it may nevertheless be viewed to advantage by the microscope.



THE DIAMOND LEARNER'S TELEGRAPH INSTRUMENT.

The Electric Light in the British Navy.

A trial has just been made at Portsmouth of an installation of the electric light which has been fitted on board the Imperieuse by Messrs. Siemens Brothers & Company, who are also about to provide similar installations on board the Warspite, Edinburgh, Collingwood, and Rodney. The lights on board the Imperieuse comprise 375 incandescent lamps of 20 candle power, which are disposed so as to illuminate all parts of the ship, including the engine rooms, stokeholes, and magazines; and also a couple of search arc lights, placed at the bows and at the stern, and which are each equal to the power of 25,000 candles. The currents are generated by three Siemens dynamos, on the combined and self-regulating principle, each of which is driven by one of Willen's compound two-cylinder engines, which is fixed to the same bed plate as the machine which it drives. The number of revolutions per minute is 400. The machines are interchangeable, and can be connected or thrown out of action by a simple switch arrangement. One of the machines supplies the search lights, and another is equal to maintaining 320 of the incandescent lamps aglow, which is considered as many as will be necessary as a rule to be alight at the same time. When the whole of the incandescent lamps are required to be lighted at the same time, two dynamos will be demanded for the several leads, otherwise one will be kept as a reserve against accidents. The arrangements have been superintended on behalf of the company, says the *Naval and Military Gazette*, by Mr. Collings, and the preliminary trial during the day and after dark proved very satisfactory.

Shying Horses.

This trick or vice is generally the effect of nervous timidity, resulting from an excitable temperament. It is aggravated by improper handling. To punish a horse for shying introduces a new cause of fear. The horse will be more alarmed and show more tokens of fear at the prospect of a whipping than at the imaginary object of danger in the road. Hence one bad habit is confirmed by the introduction of another. It is impossible to whip terror out of a horse or pound courage into one. Kindness and gentle persuasion are the best weapons to correct the pernicious habit of shying. The less fear exhibited by the driver, and the less notice taken of the shying by using harsh means, the sooner it will be given up. A careful, experienced horseman can generally detect an object likely to cause a nervous horse to shy, and by word or touch will encourage him to pass it unnoticed. When this fails, give him time to look at the object of his fear; pat him and coax him up to it, then take him past it two or three times, till he takes no notice of it.

When defective sight is the cause of this bad habit it is incurable, and if the eyesight is failing, the horse for ordinary driving and riding will be perfectly useless. A mare we knew that had gone quietly in harness for two or three years, suddenly took to jumping the white stone crossings of an ordinary macadamized street, as if they were water brooks. In three months she was stone blind.

THE DIAMOND LEARNER'S TELEGRAPH INSTRUMENT.

The leading feature of the instrument here shown consists in so forming the sounder, anvil, and key that they have a diamond-shaped cross section, and in so making the base of the sounder and of the anvil that when set up the two form a diamond outline. The magnets of the sounder are inclosed in metallic cases, and the various metallic portions of the instrument can be made to present the appearance of either gold, bronze, or brass. The black baseboard is of wood.

This instrument—designed by the Novelty Electric Company, of 5th and Locust Streets, Philadelphia, Pa.—presents a unique and attractive appearance.

Toads as Bee Eaters.

The toad may be useful in kitchen gardens as a slug and insect destroyer; the freer you can keep your apiary from his presence, the better. Toads will wait at the foot of a hive to seize any honey-laden bee that may happen to fall to the ground on its return from foraging, and one bee master, says a correspondent of the London *Graphic*, saw over a dozen little workers captured in the space of half an hour by an old fat fellow, who darted out his tongue with wonderful celerity immediately he saw a bee on the ground. The bees had been collecting pollen, and many of them, being heavily laden, were unable to reach the floor board of the hive.

A Guide to Rose Culture.

Beautiful Roses for All.—We have received the *New Guide to Rose Culture*, published by the *Dingee & Conard Co., Rose Growers, West Grove, Pa.* (see advertisement), and take pleasure in recommending it as one of the handsomest and best catalogues of the season.