SYDNEY INTERNATIONAL EXHIBITION.

[*Continued from page* 8.]

NICOLE & NIELSEN.

This exhibit, made specially for the Exhibition, comprised a full line of plain levers, split seconds, chronographs, calendars, repeaters, etc., and was a representative display of their peculiar style of manufacture in all its details. The cost of these watches, compared with others of similar construction and finish, was excessive; and while they show good timekeeping qualities, they do not equal that of other exhibits.

As representing their own methods of construction they are of the first order of merit, and are adjudged a first-class award.

THOS. RUSSELL & SONS

exhibit a full line of their manufacture, which, upon comparison with other exhibits of the same general character and construction, places them in the third order of merit, and they are adjudged a third-class award.

S. BACKSCHMID

exhibits a class of cheap watches of very inferior workmanship and finish, of the last order of merit, and adjudged a fourth-class award.

N. CASTLEBERG & CO.

exhibit a meritorious line of watches in many respects, of good finish, and not excessively high priced for their performances; of the second order of merit, and adjudged a second-class award.

A. LANGE & SONS

exhibit a class of watches possessing many elements of merit, and of superior finish in many respects and at a cost which is quite reasonable. That the watches are constructed upon scientific principles and are intended as reliable timepieces, is shown from Observatory tests. The variations show that care has been taken to approximate a perfect adjustment, and that a partial success has been attained. A peculiarity in the construction of the balance wheel—having a horizontal split from the timing second holes each way—is noticeable, which we fail to understand. This exhibit was made expressly for this Exhibition, and Observatory rates sent with each watch, and, as a representative exhibit, although small, was the second best examined, and is, in its class, of the first order of merit, and adjudged a first-class award.

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LOUIS AUDEMARS

exhibits a wonderful class of complicated watches, calendars, repeaters, chronographs, etc., etc., combined in one watch, and elaborately cased and artistically finished. The great element of merit in this exhibit is in the combination of the great number of unusual functions for a watch, and by skill in workmanship and mechanical science securing a correct performance.

The enormous cost of these watches is an effectual embargo on their use to any except the very few, and their utility is, therefore, very limited. In their class they are, however, of the first order of merit, and adjudged a first-class award.

G. TRIBANDEAU

exhibits a considerable collection of watches in a great variety of cases, of a class of workmanship, finish, and performance calling for the fourth order of merit, and are adjudged a fourth-class award.

A. H. RODANET

exhibits two marine chronometers only, one of which was broken and the other out of order; commended.

INTERNATIONAL WATCH COMPANY

exhibit a collection of watches of the third order of merit, and adjudged a third-class award.

In concluding this report, the judges very much regret the limitation in time which has prevented them securing position tests of this very interesting exhibit in horology, as much on account of the exhibitors as on their own account. Such advances have in the last few years been made in this science that, in the interest of the public as well as of the manufacturers, a sufficiency of time is desirable to make tests in five or six positions, and fourteen days should be allowed to each position. Tests for heat and cold, and an opportunity to carefully note barometric and thermometric influences upon the various systems of adjustment, would be very valuable and interesting.

Respectfully, etc.,

GREGORY P. HARTE, *Chairman*, United States.
H. C. RUSSELL, B.A., F.R.A.S., Great Britain.
J. MCGARVIE SMITH, New South Wales.
P. E. BOUND, Switzerland.
E. BECKMANN, Germany.

Corn Magnets.

Every kind of salve or lotion that is supposed to remove or relieve corns meets with a large sale. Corn files and pencils are getting stale, and an enterprising inhabitant of Dresden has lately brought out what he calls a "corn magnet." It is evident that it is as unlike a magnet as possible, for an examination shows that it is made of sulphur colored with graphite. The directions are to set fire to one end, and let a drop of the melted sulphur fall upon the corn. A convenient and agreeable operation, especially if the corn is on the bottom of the foot. It is needless to say that the corn usually survives the slight burn and lives to torment the owner again. All burns, whether by caustic or otherwise, should be avoided.

Experiments on the Resistance of Materials.

Prof. J. Burkitt Webb, C.E., now in Europe, writes as follows:

On the invitation of Prof. Spangenberg we visited the "Versuchsstation," at the Gewerbe-Akademie, where the important experiments upon materials for engineering purposes are being made. These tests are of two kinds—trials of strength and trials of endurance. The first are made by means of very heavy and accurate machinery, mostly new within the last two or three years; the latter are the celebrated "Dauer-Versuche," a description of which we will reserve for another letter.

The main machine, of which there are three or four duplicates at work at various points in Germany, is housed in a special building in the interior court of the academy. It consists of heavy iron "ways," some fifty feet long, accurately planed and secured to a stone foundation, with a hydraulic pump and scales at one end, and a number of massive attachments for subjecting the piece of iron or other material to various kinds of strains. There are also other instruments which belong to the machine as delicate as it is heavy, and which are used for adjusting the parts of the apparatus, reading the results of a test, or making calculations. This machine differs from others in the way of measuring the force used. It has been the custom to take the pressure on the liquid in the hydraulic cylinder, as shown by a manometer, as the basis of calculation. This introduces an inaccuracy, as part of this is due to the friction on the piston packing, and the true pressure is less than that shown by this irregular quantity. To avoid this difficulty a massive lever is introduced between the hydraulic press and the point where its pressure is applied. One arm of this lever is one-eighth inch long, and the other five hundred times as long, so that to measure a pressure of one hundred tons, four hundred pounds must be placed on the scale pan which hangs from the end of the long end of the lever. The fulcrum rests against the piston, and the short end of the lever is connected by heavy links with the apparatus by means of which the strain is applied. Technically speaking the fulcra of scales are "knife edges," but to convey a pressure of one hundred tons and remain free to move, these edges must be very obtuse, perhaps 160° to 170°; they must be as long as possible, some fifteen inches, of the best hardened steel, accurately ground, and must rest against a hardened plate of steel. Made with the greatest care the sharp edge under such a pressure will sometimes make a dent in the plate and the scales are clogged. As it is very difficult to measure the one-eighth inch with accuracy, another lever is provided with a ratio of one to ten, and with a short arm long enough to be made of a certain length with but a small percentage of error. To test the main lever this occupies essentially the same place as a sample of iron to be stretched; it is loaded with, say, two hundred pounds, which it multiplies to a ton; this pressure is then weighed by placing four pounds upon the main scale pan, and the fulcrum of the main lever is adjusted until the two weights balance.

The attachments consist of: I. Jaws for holding round, square, and flat bars to be submitted to tension. II. Arrangements for holding beams and columns in various ways at their ends, and compressing them until they are crushed or "buckle." III. Two massive graduated iron beams, which are placed crosswise on the "ways," and used for twisting shafts, railroad axles, etc. IV. A face plate, about four feet square, for holding plates of boiler iron nearly as large by the perimeter, and crushing in the middle by forcing various shaped pieces against it. V. Apparatus for bending a beam by crushing an angular piece into it; and in the same connection, VI. Shears for cutting off bars of metal and measuring the force required.

In connection with this main machine were some, quite old, which had been used in the infancy of the subject by a former professor, and a new special machine for the same purpose as attachment V., and which seemed to "kink" a piece of railroad iron as if it were only lead. In this the pressure was obtained by screws.

Among the instruments used for the adjustment of the parts of the main machine we saw the finest cathetometer we had ever seen. This instrument, by Breithaupt, in Cassel, has two telescopes, with micrometer screws with more than one hundred and twenty-five threads per inch, and scales graduated on glass with more than six hundred and twenty five divisions to the inch. Another instrument for measuring the deflection, in two directions at once, of a column under pressure, has micrometer screws with more than two hundred and fifty threads per inch. We saw also a planimeter, which not only calculated mechanically the area of a figure, but gave also its center of gravity, moment of inertia, etc. We saw also a French calculating machine; the other apparatus is, we believe, all German. If one is, however, critical, it will be found in many lines of business that all the fine goods here are imported, though naturally the Germans are slow to acknowledge it.

We witnessed the experiments on a sample of round iron over an inch in diameter, and on a piece of iron plate three inches wide by half an inch thick. It is perhaps needless to say that they seemed to stretch like putty and to break like thread. The pressure is put on a few hundred pounds at a time, and the elongation is read by two telescopes and a scale, which multiply the distance five hundred times. At the same time the first "elastic limit" is watched for. Before this is arrived at the piece will return to its original length when the tension is removed; after this the stretching is in part permanent. One of the facts brought out is that there are *several* elastic limits, in copper seven or eight. The appearance of the surface after the elastic limit is passed and the iron stretches is peculiar. A wavy appearance is seen, and longitudinal ridges begin to form, due to the changes going on in the crystals, by which they adapt themselves to the increased length. After a further general adaptation of structure becomes impossible, these appearances culminate in the weakest part. The apparatus for measuring the increase in length has long since been removed, and the places where it was attached have been filed smooth to avoid introducing the weak point artificially. The diameter of this part now reduces rapidly, and the surface becomes rough and the iron hot—you can see it stretch. When it has reduced twenty-five or more per cent it gives way suddenly with a sharp crack. The percentage of reduction before breaking is now recorded with the observations on the elasticity and the breaking strain, and the experiment is at an end. It suggested itself to see if the work done in pulling the iron apart was fully accounted for by the heat generated. We could easily calculate the work up to the point of maximum tension, but after this the force required was not measured; however, a rough calculation showed that the iron was as hot as required, or at least that the data would require to be quite complete if any residual was to be found.

Berlin, May 13, 1880.

ENGINEERING INVENTIONS.

An improved wheel guard, which will push any obstacles on the track aside, and which can be adjusted to a greater or less height above the rails, has been patented by Mr. Solomon Brisac, of New York city. It consists in a wheel guard formed of a metallic box with a beveled front side, which box is adjustably fastened to the front end of a recessed plate resting on and partially surrounding the grease box. The box is braced by means of a rod attached to its forward end and passing into a socket fastened to the bottom of the car.

An improved water motor, constructed on the general principle of a rotary engine, in which two compartments are arranged side by side, with a partition intervening, and in which the sliding pistons in the piston wheels in the two compartments are arranged at right angles to each other, has been patented by Mr. William E. Seelye, of Anoka, Minn.

Mr. Stephen Barnes, of New Haven, Conn., has invented a vibrating propeller, adapted to small boats and vessels to be operated by either hand or steam power. The floats are arranged so that they will offer no resistance on the return stroke.

An improved device for removing snow from railway tracks, and especially from between the rails, has been patented by Mr. David M. Horton, of Fishkill Village, N. Y. It consists of a revolving brush, a mould board in juxtaposition thereto, and a fan blower, in combination with suitable driving gear for propelling the brush and fan.

An improvement in steam traps, patented by Mr. Hugh O. Ames, of New Orleans, La., consists in combining with a vibratory arm carrying a water receiver, a side apertured hollow trunnion, a discharge pipe, a jacketed standard, and an outlet pipe.

An improved cotton press has been patented by Mr. Alfred A. Janney, of Montgomery, Ala. This invention relates to an improvement in the class of cotton and hay presses in which the follower is worked by a screw that passes through a nut, to which the required rotary motion is imparted by means of lateral sweeps or levers. It consists in the means for supporting and securing the levers and forming a vertical guide for the screw, so that the levers are prevented from rocking or swaying as power is applied in the operation of packing.

Improved Steam Canal Boat.

The late experiments in canal steamboats bid fair to be a complete success. The Baxter steamers were not sufficiently remunerative to continue the building of that kind of boat. They do not carry a sufficient load, owing to their build, and that is made necessary by the form and arrangement of the machinery and propelling power, the propeller being that form used by the tug in Buffalo. The new style, which bids to pay handsomely, is as full a bow and stern as the ordinary first-class canal boat. The propelling power is radically different from the tug propeller. The wheel is eight feet in diameter and placed close to the stern; the boiler is upright, with a single engine, very compact machinery, taking up no more room than the stable in many boats, and enabling the boat to carry 7,500 bushels of corn and coal for the trip. With this cargo they run from Buffalo to New York in seven days on five and a half gross tons of coal, saving river and harbor towing. One returned from New York to Buffalo in one hour less than seven days, bringing one hundred and thirty tons of freight. The outlook now promises to supersede mule and horse towing. The Belgian system of cable towing will take that large number of boats now relying on the mule, and deliver them promptly as consigned and in much less time and cost than can be done by the mule. Both systems are necessary for rapid movement on the canal, and to cheapen the transfer from the West to the seaboard. Steam is sure to supersede animal power on the canal, as everywhere else. The canal steamboats are at last so far perfected as to insure a handsome profit in running them, and a large number will soon be at work on the canal. Two are to be constructed in Lockport as speedily as possible by one of our most enterprising boat builders, and the machinery is contracted for, thus opening up a new industry for our numerous and worthy mechanics.—*Lockport (N. Y.) Journal.*

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they are sufficiently accurate to enable the ordinary observer to find the planets. M. M.

POSITIONS OF PLANETS FOR JULY, 1880.

Mercury.

On July 1 Mercury sets a few minutes after 9 in the evening.

Mercury can be readily found, early in July, a few degrees south of the point of sunset; the planet moves rapidly southward, but can be followed, and may be seen as late as the 20th. On July 18 Mercury has nearly the declination of Regulus.

Venus.

Venus keeps nearly the path of the sun, setting after the sun late in July, but so nearly with it that the planet is not likely to be seen.

Mars.

Mars has moved from its position nearly in line with Castor and Pollux toward Leo. It sets on July 1 at 9h. 44m. P.M. On the 31st Mars sets at 8h. 32m.

On the 31st, at meridian passage, Mars and Uranus are nearly together. Uranus is east of Mars and half a degree south.

Jupiter.

Jupiter is coming into the evening hours.

On July 1 Jupiter rises a few minutes after midnight. On July 31 Jupiter rises a few minutes after 10 P.M. It will be known at once by its brilliancy.

Besides the ordinary belts of Jupiter the planet still shows at this time (June 10) the large ruddy spot spoken of by many persons some weeks since. This spot is elliptical in shape; its longest diameter is about one-fifth that of Jupiter. A small glass will show it, and the ordinary observer can, by watching its appearance and disappearance and reappearance, determine the time of rotation of Jupiter on its axis, or the length of the planet's day.

The best evenings for looking at Jupiter are those of July 23, when the satellite nearest to Jupiter goes across its face, preceded by its shadow; July 28, when the first and second satellites will make similar transits; and July 29, when Jupiter will rise without the presence of its third satellite, which will be in eclipse, and will come out of the shadow after midnight.

Saturn.

Saturn follows close upon Jupiter, but keeps further north in declination by about 2½°.

On July 1 Saturn rises 36m. after midnight. On the 31st Saturn rises at 10h. 38m. P.M.

The waning moon will pass north of Jupiter and Saturn on the 27th to 28th.

Any one who has a glass sufficient to show the ring of Saturn and the largest satellite, Titan, will find this planet intensely interesting, and the movements of the satellite will show the time of its revolution in its orbit around Saturn.

Uranus.

Uranus rises after the sun, and sets too nearly with the sun to be seen.

Neptune.

Neptune may be seen, with a good telescope, in the early morning hour. Neptune is 2¼° west of Alpha Ceti, and 11° north. It approaches Alpha Ceti during the month, and if it can be found, may be known to be a planet by that movement.

Fires in New York.

The report of the Board of Fire Commissioners, just printed, shows that during the year 1879 there were in this city 1,551 fires, of which 1,029 were discovered by persons not connected with the Fire or Police Department. In 1,456 cases the fires were confined to the buildings in which they originated. Twenty-five buildings were totally destroyed, and 69 were greatly damaged. Of all the fires, 1,061 were extinguished by buckets of water and fire extinguishers. The total estimated loss by fire during the year was $900,280 on buildings and $4,771,300 on stock, making a total of $5,671,580. The estimated insurances on the buildings were $7,276,446, and on stock, $14,525,264, making a total of $21,801,710. The estimated uninsured loss was $180,060. In three cases the loss was between $100,000 and $115,000; in one case $168,908; in one case $352,185; in one case $333,900; and in one case $1,978,991. In 1,066 cases the loss was less than $100.

Nearly a quarter of all the fires were caused by carelessness, and 100 are attributed to children playing with matches and fire. Forty fires were caused by the spontaneous combustion of oily rags and other materials, and 93 by exploding kerosene lamps. Four members of the department and 12 citizens died of injuries received at fires during the year, and 139 firemen and 54 citizens were more or less injured.

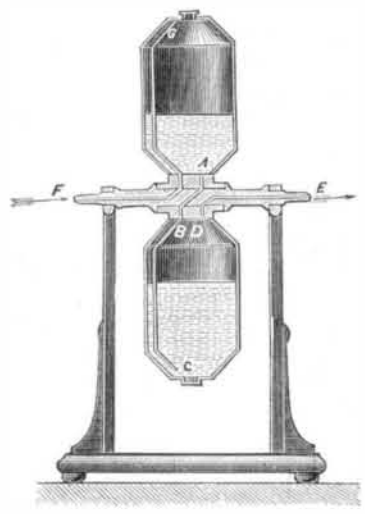
There are 729 uniformed members of the department The pay roll of the whole department for 1879 was $1,030,822.14, and the appropriation for all expenses was $1,254,970. The appropriation for the present year is $1,307,670. The department now possesses 233 horses, 1 marine steam fire engine, 58 steam fire engines, of which 5 are self propelling, 10 chemical engines, 24 hook and ladder trucks, 108 chemical fire extinguishers, and 4 aerial ladders, together with other fire apparatus.

The annual inspection of the department showed that the quickest average time in hitching a team was 3·17 seconds, and in hitching a single horse, 5·66 seconds. The general average in hitching all apparatus was, in 1879, 9·54 seconds; in 1878, 10·26 seconds; and in 1877, 13·03 seconds.

During the year, $30,300 was collected for licenses for the sale of kerosene oil, each license costing $10. The Fire Department Relief Fund now amounts to $422,539.07, and the insurance fund to $12,780.

ASPIRATOR AND COMPRESSOR.

Professor Marangoni, of Pavia, has invented an aspirator for measuring gases which is much simpler than many now in use in laboratories, which latter have the defect that the air or gas ascends through the descending liquid and makes thus the measuring of the former uncertain. The improved apparatus is shown in our illustration. It consists of two vessels attached to a fixed horizontal shaft, F E, which is placed upon two upright supports. This shaft has several ways or passages made in it which performs the functions of the taps. The water of the upper receptacle passes into the lower one by the passage, A, and thence through the tube, B C, issuing at its lowest extremity at C. The air contained in the lower vessel is thus emitted by the channel



D E, cut into the shaft, while the air or gas is aspirated in the same ratio by the passage and tube, F G. The apparatus acts thus at the same time as aspirator and compressor. It is simple, and will be a useful addition to the laboratory.

New Photoglyptic Process.*

WALTER B. WOODBURY.

It is now thirteen years since I had the honor of introducing in France my new photoglyptic process, which, up to the present time, has remained in the hands of very few, owing to the great expense hitherto necessary to start the working of it. For some time I have been engaged in making experiments with a view to discover a system which should be at the same time simple and inexpensive; and the process which I have this evening the honor to bring before your notice is the result of my researches.

The summary of the new system is as follows:

To obtain from negatives reliefs on glass similar to transparencies by the carbon process, but modified in the quantity of materials used.

To attach, and keep in absolute contact with the relief so obtained, a sheet of tin foil.

To solidify this sheet of tin foil by coating it with copper; then backing it up with another sheet of plate glass covered with a composition; and then to detach the whole from the first relief—the result being a mould ready to place in the press and print one thousand or more proofs.

I commence by showing you the relief made from the negative, and explaining how this is obtained.

I take a sheet of plate glass of a convenient size, and place it in hot water, together with a sheet of paper a little smaller; then, having driven out the excess of water by means of a squeegee, I place it on a leveling stand. Having prepared a solution composed of gelatine 200 parts, water 1,000 parts, glycerine 20 parts, white sugar 30 parts, with a little Indian ink, and filtered the same, I pour a sufficient quantity on the paper and spread it up to the corners with the finger. These plates are then dried in a dry place and can be kept until wanted.

To sensitize the plates I employ a bath of bichromate of potash of six per cent, and again dry them. Without doubt this method is rather long; but one should consider that each proof made is capable of giving five or ten thousand prints if necessary, as the same relief will make many printing moulds. I tried, with the aid of the Autotype Company, of London, to get a suitable tissue; but as this requires a uniform thickness of half a millimeter the ordinary system did not succeed. When the sensitized plate is dry the edges are cut with a knife, the glasses serving over and over again. I show you a piece of this prepared paper.

As in the carbon process, it is necessary to place a border of black paper at the back of the negative, and to cut the sensitized tissue a little larger than the opening.

After the exposure the gelatine is fixed on a collodionized glass by placing them both in water and squeegeeing the surface; but in dry weather it is as well to use albumen in place of collodion, as used by M. Ferrier for his transparencies in carbon. The glass holding the gelatine is now placed in a hot water bath heated to 42° Centigrade, and left till the paper comes away from the gelatine, when it is placed in this apparatus by the frame holding the grooves.

By means of this small gas regulator the temperature is kept always the same, namely, 50° Centigrade. The water should be now and then agitated by lifting up and down the frame holding the glasses.

After a space of three or four hours the reliefs will be sufficiently washed, and can be taken out and placed in alcohol to dry quickly and sharp at the same time. In this stage of the process all spots or scratches that may have been on the negative can be removed (being in relief on the gelatine) by means of a piece of glass. The relief is now ready to be covered with the tin. You will observe that up to the present the operations have been almost the same as those necessary to produce a transparency in carbon.

As it is of the first necessity that the tin should be kept in absolute contact with the gelatine relief, I prepare the latter by rubbing it over with a piece of flannel charged with a greasy matter (pomatum answers as well as anything). I then make a border of India-rubber in benzine round the glass. The effect of this is to prevent any air from returning between the tin and the relief when once it has been driven out.

Taking care that the back of the glass is perfectly clean, it is now placed on the steel or glass bed of a rolling-press. A sheet of tin foil (without holes) that has been smoothed on a sheet of glass by a soft brush is now laid on it, and then three or four thicknesses of blotting paper. The whole is then passed under the cylinder several times, each time increasing the pressure. The surface of the tin is now ready to place in the electrotyping cell, but must first be cleaned with a solution of caustic potash to remove any grease, and bordered with shellac varnish to prevent the copper from depositing where not required.

Electric contact is made by means of the small apparatus, on removing a small proportion of the lac varnish. After two or three hours sufficient copper will have been deposited, and after drying can be then attached to another glass, on which it will remain.

This glass is covered while hot with a composition of shellac, resin, and Venice turpentine, and can be prepared in advance, using an iron plate heated direct by the gas flame. The same iron plate is employed to again soften the composition and attach it to the copper; but this time heated only by boiling water, this temperature being sufficient to soften it until it enters into all the hollows of the copper. On placing a weight on the two glasses the excess of the composition is forced out at the edges. When cold the glass plate on which the copper and tin are now attached can be separated from the relief, which can then be used over and over again to produce fresh matrices.

The matrix or intaglio is now ready to place in the printing press, and the remaining operations of printing are exactly the same as those used in the old process of photoglyptic printing.

In placing the mould in the press it is advisable to place one or two thicknesses of stout blotting paper, previously wetted, under the mould to give to it a slight amount of elasticity and, at the same time, to keep it in place.

As in all other mechanical processes a reversed or pellicle negative is required; but it is very simple to print upon a specially prepared transfer paper, and, instead of mounting the print with the face uppermost, to attach it under water to the mount, and when dry to detach the paper on which the print has been made. By this means there remains only one thickness of paper instead of two, thus doing away with an objection which has often been found in mounted photographs for book illustration.

* A communication to the Photographic Society of France.

NEW INVENTIONS.

An improved combined cutting and clinching tool has been patented by Mr. Peter D. Graham, of Black Hawk, Col. The object of this invention is to provide a new, useful, and convenient tool for cutting and clinching horseshoe nails.

Mr. John J. Berger, of Brooklyn, N. Y., has patented an improved hand perforating or check stamp of the class which are used to cut or perforate the paper with figures and letters as a safeguard against alterations of the check; and the object of this improvement is to perforate the check with needle points, and at the same time ink the perforations, whereby the numbers may be clearly marked without cutting large openings in the paper.

An improved apparatus for the manufacture of nitric acid has been patented by Mr. Paul Marcelin, of Black Rock, Conn. The object of this invention is to furnish apparatus for manufacturing nitric acid so constructed that the stronger acid may be separated from the weaker acid as the acid passes from the retort to the receiving bottles, to obtain a strong acid suitable for use in manufacturing nitro-glycerine.

Mr. Max Rubin, of New York city, has patented an improved shawl strap, so constructed that either strap may be wound up alone, or both may be wound up together, or one may be wound up tighter than the other, by adjusting the handle.

Mr. Ambrose Madden, of Asbury Park, N. J., has patented an attachment for use with halters for preventing horses from cribbing and to cure them of that pernicious habit; and the invention consists in a combination of rigid arms and straps hung upon the halter and carrying a spiked plate, which is retained beneath the animal's under lip in such manner that the motions of the horse in the act of cribbing cause the spikes to prick.