THE CRAMP SHIP YARDS.

(Continued from first page.)

"spaced" along the keel, they are held in position by a very complicated system of false work or scaffolding. To facilitate this work, a great number of railroad tracks have been arranged, so that the heavy pieces may be readily carried to any part of the yard. The Cramps own three small steam engines, and these are used especially for this purpose. In connection with this work an ingenious combination of the locomotive and the derrick is frequently used. The machine is operated by one man, and runs backward on the tracks, lowers and hoists, and turns laterally upon its tracks. The yard is also supplied with many forms of derricks, which are set up in convenient positions to be used in placing the heavy parts in position. A number of small forges may also be moved about to various parts of the ship to heat the bolts for riveting.

The lighter parts of this material are forged in the yard. The iron foundry for carrying out this work is the most extensive one in America, being 415 feet long by 264 feet wide. This is well equipped with much valuable machinery. The heavier parts of vessels, such as the steel armor plates, are made by special contract outside of the yard. The material used in constructing the vessels is stored in a special section reserved for it, comprising 10½ acres of space. This is provided with stationary and traveling locomotives and derricks for handling the heavy pieces. A special feature is an immense traveling crane moving over an area 350 feet long and 50 feet wide, and operated by a steam engine.

After the plates have been united to the steel frame of the hull, the work of putting in the boilers and other machinery is carried out. The boiler shop, which now comes in use, is the largest shop of its kind in America, and one of the largest and best equipped in the world. It is 387 feet long and 112 feet in width. An interesting feature of this shop are the two huge traveling cranes. These are run by electricity and move swiftly from one end to the other of the immense shop, often lifting and carrying boilers weighing 70 or 90 tons. The power house, which supplies the energy to operate these acres of machinery, is also one of the best equipped plants of its kind. It includes extensive hydraulic, pneumatic and electric plants, whose power is distributed through the ship yard by means of pipes or wires, as the case may be, and applied to the operation of portable drills, riveters, lighting, ventilation, blowing furnace fires, bending and shaping machines, moving derricks and various other uses.

The manufacture of various materials used in the ship yard includes an extensive brass foundry, fully equipped to produce every variety of brass, bronze, manganese bronze and white metal castings. There are extensive facilities for making castings and the complement of cranes and traveling machinery. Adjoining the brass foundry is an ordnance plant fully equipped for the manufacturing of breech-loading rapid-fire cannon up to and including 4 inch caliber, and for making projectiles of every variety required for them.

In connection with the yard is a large dry dock, 462 feet long by 70 feet wide, with a draught of 22 feet on the sill at mean high water. This is shown at the upper left-hand corner. The water front of this dry dock is 234 feet. Connected with this is a marine railway capable of hauling out vessels of 1,000 tons register. In addition to these facilities the Cramp Company is permitted to use the United States dry dock, at the League Island Navy Yard, for docking and repairing vessels too large for their own docks

To perform the work of handling heavy materials such as boilers, cannon, etc., a monster floating derrick has been constructed which is capable of lifting a weight of 125 tons. The Atlas as it is called is said to be the most powerful derrick in the world. It rests on a floating base and rises to a height of 110 feet. It affords a perpendicular lift of 60 feet, the overhang of boom being 35 feet. The first page illustration will give a good idea of the manner in which the derrick is used. The steamer lying beside the derrick is the well known man-of-war New York. The photograph was taken while the Atlas was in the act of lowering one of the 70 ton boilers to the hold. The work of raising the boiler, carrying it a distance of 80 feet and lowering it into position was accomplished in the remarkably short time of twenty-six minutes.

EQUATORIAL STAND FOR SMALL TELESCOPES.

BY GEO. M. HOPKINS.

One hour's use of an equatorially mounted telescope

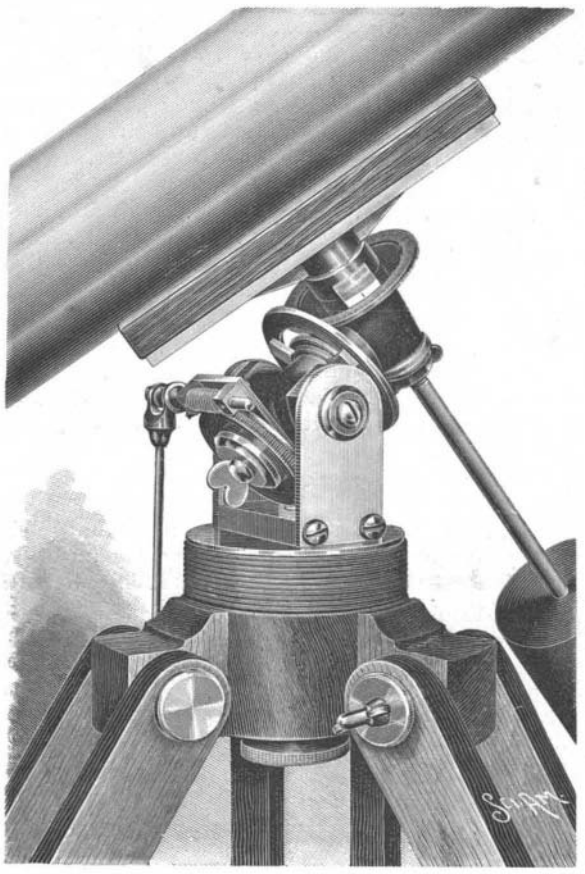

Fig. 1.—EQUATORIAL STAND FOR A SMALL TELESCOPE.

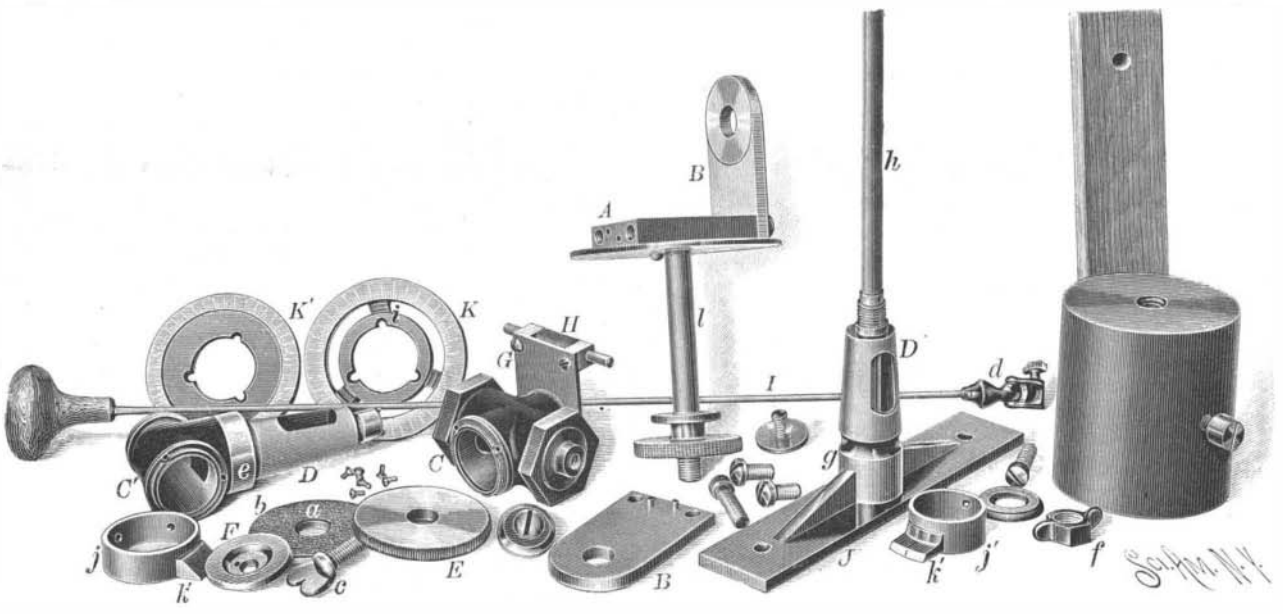

Fig. 2.—PARTS OF SIMPLE EQUATORIAL STAND.

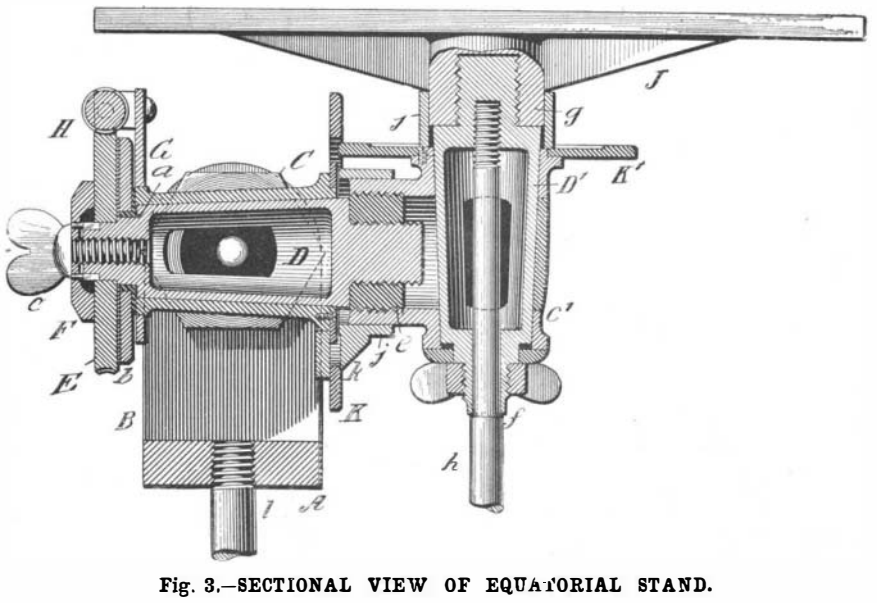

Fig. 3.—SECTIONAL VIEW OF EQUATORIAL STAND.

will convince the amateur telescopist who has been used to the altazimuth stand that the advantages possessed by the equatorial are very great. The ease with which an object may be followed, and the facility with which a star can be found, when the mounting is provided with graduated circles, which may even be crude, warrant the outlay if the stand be purchased, or the labor and expense, if the amateur should choose to make the stand with his own hands.

The writer, adopting the latter plan, constructed a very satisfactory equatorial stand using stopcocks for the two axes, as shown in perspective in Fig. 1 and in detail in Figs. 2 and 3, and although the construction may be readily understood by reference to the illustrations, a few words of explanation may be of service.

The telescope for which the stand was made has a three inch objective with focal length of 40 inches. The tube, which is of brass, is re-enforced by an internal plate, held in place by screws, and this plate receives the screws by which the attachment to the stand is made.

On the top of the wooden part of the stand rests a brass disk, which, together with the brass block, A, forms the base of the telescope support. To the ends of the block, A, are secured upright end plates, B, which are perforated near their upper ends.

Between the plates, B, is placed a three-fourths gas service cock, C, the ends of which are plugged, and the square ends of the plugs are turned, forming trunnions, which enter the perforations of the plates, B, but do not pass quite through. The trunnions are tapped to receive screws, on which are placed washers, which bear against the plates, B, and clamp them against the ends of the stopcock, which is faced off so that it is of exactly the same length as the block, A. The trunnions form the axis on which the telescope is tilted to adjust it for latitude, and one of the angles of the hexagon end of the stopcock is filed off even with the rounded upper end of the adjoining plate, B, and a line is drawn across the plate and stopcock when the polar axis of the telescope is parallel with the earth's axis, so that readjustment may be made without trouble.

The plug, D, of the stopcock, C, has a projecting end, having one flat side, to which is fitted the usual washer, a. This washer is turned down to receive the disk, b, which is soldered to the washer. The disk, b, is faced with wash leather. The end of the plug, D, which is threaded to receive the nut, when the stopcock is applied to its intended use, is covered with a piece of tubing soldered to the screw, and turned off to receive the worm wheel, E, which turns freely thereon.

To the end of the plug, D, is fitted a cap, F, which is held in place, and made to exert more or less pressure on the worm wheel, E, by the thumbscrew, c, which enters the end of the plug and bears on the cap. The cap, F, is perforated to receive two studs projecting from the end of the plug.

On the smaller end of the stopcock casing is soldered a perforated plate, G, which supports the bearings for the worm, H. This worm engages the worm wheel, E, and its axis is prolonged beyond the bearings, to receive the universal joint, d, of the rod, I, this rod being of sufficient length to be easily grasped by the observer. The squared end of the plug, D, which is intended for receiving the key by which the plug is turned, is in this case turned and threaded to fit the bushing, e, inserted in one end of the stopcock, C'. The other end of this stopcock is cut off, and the opening thus left is closed by means of solder. The plug, D', of this stopcock is unchanged so far as the threaded smaller end and washer and nut are concerned, but the nut, f, is slotted in diametrically opposite corners to receive wings which are soldered therein. The square end of the plug, D', is turned and threaded to receive the boss, g, of the cross arm, J, attached to the telescope. The cross arm shown is built up of pieces of brass fastened together with screws and soldered. A casting would doubtless be simpler. The plug, D', is drilled axially to receive the counterbalance rod, h, which is screwed into the plug, as indicated in the sectional view.

The larger ends of the stopcock casings are rebated to receive the graduated circles, K, K', secured in place by small screws.

Owing to the close connection of the parts, the circle, K, has an annular slot which cuts it into two concentric pieces, held in proper relation to each other by arms, i, soldered to the back of the circle.

This arrangement allows the circle, K', to swing freely.

The hexagon end of the stopcock, C', which receives the bushing, e, is turned to receive the ring, j, carrying

a beveled index piece, k, about ½ inch wide. A line drawn down the face of the piece, k, serves as an index. In a similar way a ring, j', fitted to the boss, g, serves to carry an index for the circle, K'.

The circles here shown are electrotypes made from a galvanometer scale, soldered to brass plates and silvered, some black varnish being rubbed into the graduations to render them more distinct.

The equatorial mounting is secured to the head of the wooden stand by the rod, v, screwed into the block, A, and provided with a milled nut on its lower end.

In Fig. 1, the mounting is shown adjusted for the latitude of New York, 40° 41'. The screw, c, and nut, f, being loosened, and the polar axis being parallel with the earth's axis, the telescope is pointed to a star or other object, when the nut, f, is tightened, thus clamping the declination axis. The screw, c, is also tightened, when the instrument will be made to follow the object by turning the screw, H.

Although the slow movement is of great utility, it may be omitted and the instrument may be guided by the hand. The mounting may be further simplified by omitting the graduated circles, and still possess great advantages over the altazimuth mounting.

A stand formed of three-quarters service cocks is large enough for a three inch telescope. It has a smooth and steady motion and does not vibrate. There is, however, no objection to the use of larger stop-cocks.

The hints here given may serve as suggestions. The amateur may carry out the work in different ways. The reader is referred to Gibson's "Amateur Telescopist's Handbook" for simple instructions for using and adjusting the equatorially mounted telescope.

Four Year Old Ice.

It is stated by Portland ice dealers that this has been the best year for business on the Kennebec since the great season of 1890. One man says that some ice four years old has been sold. "This is very unusual," says the Portland Press. "Ice that is four years old costs more to get out of the houses than it costs to cut it in the first place. For it is the ice that is at the bottom of the house, and has been consolidated into a solid mass by the water flowing down from the melting cakes above and freezing these underlying cakes together. To run out a block from this is very difficult, for it is like quarrying stone from the solid ledge. It is a good thing that it can be sold, if only for the cost of handling it, because it must be got out of the building somehow. Generally they bore holes in it with an auger, put in a stick of dynamite, and blow the ice into fragments, which are then shoveled out."

Report of an Engineering Insurance Company.

A prominent engineering insurance company in England has recently made public some very interesting figures concerning the causes of accident to engines and boilers. During the past year the company found that 33 per cent of the accidents to the boilers insured in their company were owing to weakness, faulty construction, and bad workmanship; 27 per cent were due to purely accidental causes; and only 12 per cent were the result of carelessness of owners or attendants. The great majority of the accidents were owing to the failure of spur gearing and to defects in valves and valve gear. A large number, however, were due to defective columns, bed plates, and pedestals, and to the failure of screws, bolts, cotters, and straps. The company made in all some 40,000 boiler inspections, and these led to the discovery of 575 cases of defective grooving, 146 fractures and blisters, 150 safety valves dangerously overloaded, and 175 water gauges out of order. The report finally states that out of nearly 1,000 boilers found to require immediate attention, a great many would have been run without repair until they had exploded.

Protection of Iron Columns.

Some experiments were recently made by the Building Inspection Department, Vienna, says Engineering, on the protection of iron from fire by incasing it with brick. A wrought iron column 12 feet long, and built up of two channels connected by lattice bars, was used. This was set up in a small chamber constructed of brick, and the column was loaded by levers. This done, it was surrounded by a 4½ inch brick wall laid in fire clay mortar. The wall did not fit closely around the column, and advantage was taken of this to fix there samples of fusible metals, and which should serve as a gauge of the temperature attained.

Various samples of stone concrete and other materials were also placed in the chamber within the column. This chamber was then filled with split firewood, which was lighted and the doors immediately walled up with slabs of plaster of Paris. After the fire had burned out, the doors were broken in and a stream of water turned into the room from a 14 horse power fire engine. An examination of the room next showed that the walls of brick laid in Portland cement retained their strength, while most of the natural stone left in the chamber had been destroyed. The ceiling had been lined partly with plaster of Paris and partly with terra cotta tiles. Both were damaged. The inclosure around the iron pillars was still standing firm, though corners of the brickwork were clipped one inch or so, and the fire clay mortar was largely washed out of the joints. On removing the casing, however, the pillar was found to be uninjured, even the paint being unscorched, and the fusible plugs only showed a temperature of 149 degrees Fah.

A Wire Fly Wheel.

Among the most recent and novel applications of wire, perhaps none has greater interest to the mechanical world than that presented by the new wire fly wheel lately erected at the Mannesmann Tube Company's Works, Germany. Heavy fly wheels driven at high velocities obviously present dangers of breaking asunder from the great centrifugal force developed. The wheel at the factory mentioned consists of a cast iron hub or boss to which two steel plate disks or checks, about 20 feet in diameter, are bolted. The peripheral space between the disks is filled in with some 70 tons of No. 5 steel wire, completely wound round the hub, and the tensile resistance thus obtained is far superior to any casting. This huge fly wheel is driven at a speed of 240 revolutions per minute or a peripheral velocity of about 2·8 miles per minute, which is nearly three times the average speed of any express train in the world. The length of wire upon such a constructed fly wheel would be about 250 miles.—American Manufacturer.

Business Aphorisms.

Carlyle wasn't a man of business, but he would have made a success of it, had he tried it. In his writings one finds these lines of solid business truth:

A laugh is worth a hundred groans in any market.

Have a smile for all, a pleasant word for everybody.

To succeed, work hard, earnestly and incessantly.

All honest men will bear watching. It is the rascals who cannot stand it.

Better have the window empty than filled with unseasonable and unattractive goods.

When you hang a sign outside your place of business, let it be original in design and of good quality.

Wondrous is the strength of cheerfulness; altogether past calculation its power of endurance. Efforts to be permanently useful must be uniformly joyous, a spirit of sunshine, graceful from very gladness, beautiful because bright.

RECENTLY PATENTED INVENTIONS.

Engineering.

FLUE CLEANER.—Joseph O. Frazier, McCall, La. This is a readily applied apparatus for quickly removing all soot and other impurities in the flues by means of jets of steam. From a valved pipe connected with the steam supply a series of branch pipes are adapted to be extended centrally through the flues of the boiler, each of the branch pipes being provided with bearings on which they rest in the flue, and having also inclined nozzles, so that when the steam is turned on it strikes the inner wall of the flue at an angle, the jets thus removing and washing outward all impurities.

Railway Appliances.

CAR COUPLING.—Alonzo C. Packer, Pittsburg, Pa. This is an improvement in couplers of the Janney type, and is adapted for automatic coupling with another of the same kind, and for safe uncoupling from either side of the car. The recessed drawhead is vertically slotted and transversely apertured, there being a pivoted latch block, and a locking key being shouldered on the front edge and working in the vertical slot. The key locks the latch block when depressed, and a lifting bar passing through a lateral slot in the key has a cam slope on its top edge engaging the upper edge of the key slot to elevate the key when the bar is moved.

CAR COUPLING.—Blan B. Haydon, New Castle, Ky. This is a simple coupling which couples automatically when the cars come together, the uncoupling being effected from either the top or side of the car. The drawhead has a transverse coupling shoulder at the front end of the bottom of the mortise, in which is held a yielding member, and a coupling jaw in the top of the mortise is pivoted at its rear end and has its front end spring-pressed toward the bottom of the mortise. The front end of the coupling jaw has a transverse flange on its under face, and the link has its ends beveled and formed with transverse coupling shoulders. The link members can be readily coupled with the ordinary link and pin couplings.

STATION INDICATOR.—Dennis B. D'Orsey Blake, Denver, Col. Attached to a street car, this device automatically indicates to the passengers the name of the street or station passed or approached. It comprises an operating shaft geared to the car axle and formed in telescopic sections, there being a cam or spiral groove in one shaft section and in the other section a pin entering this groove, and gear wheels on the shaft sections, with shafting geared to the indicator, intermediate gears being alternately and automatically engaged when the rotation of the axle is reversed. A suitable dial in the car is marked with the points to be indicated in their relative positions, and a pointer actuated by the axle connections traverses the dial as the car moves over the route in either direction.

BLOCK SIGNAL.—James V. Richardson, Farmville, Va. According to the system devised by this inventor the signaling apparatus is carried by the engines on the line, the arrangement being such that two engines cannot run upon adjacent blocks, either toward each other or in opposite directions, without operating the signals in both engines. Parallel line conductors are arranged in blocks, and the locomotives carry contact-blocks with a signal in circuit. A circuit breaker connects the blocks of line conductors, and has cross connections to connect the positive conductor of one block to the negative conductor of the next, and connections to connect the positive and negative conductors of one block to the similar conductors of the next.

BRAKE SHOE.—Henry A. Lewis, Norristown, Pa. This shoe and attachments are so made that the shoe may be readily reversed, or a new shoe be substituted for an old one, the holder being conveniently removed from the brake beam, and the shoe when in place being held with the necessary rigidity. The improvement is also adapted for use on any wheeled vehicles as well as on railway cars. On the back of the shoe is a dovetailed, notched rib, and the holder has a dovetailed groove and dovetailed socket, with a slot in which is pivoted a spring-pressed pawl whose lower end engages the notch of the rib while its upper end projects out through the slot.

TIMBER TIE.—Luman C. Ingersoll, Keokuk, Iowa. Excepting at the two places on its top where the rails are attached, the sides and ends of this tie are beveled outwardly, thus giving a larger flat surface on its bottom than on top. Square shoulders are formed where the bevels commence on each side of the rail bearings, whereby the tie is more firmly engaged by the ballast, affording a high degree of safety against lateral displacement of the track.

ELEVATED RAILWAY.—John N. Valley, Jersey City, N. J. The structure for an elevated road designed by this inventor comprises but few elements, and may be built at comparatively low cost without the aid of skilled workmen. Suitable posts support transverse girders to which are secured hangers of inverted U-shape, to the depending arms of which are secured angle irons carrying channel iron tracks. The tracks are adapted for reversal to bring the flanges either inside or outside the structure, and the rails are secured to the channel irons.

ELEVATED ROAD CARRIAGE.—The same inventor has devised wheeled hangers especially adapted to suspend a car, or kegs or other loads, the carriage being of simple and inexpensive construction, with proper strengthening members, a novel propelling mechanism and suspension devices. The improvement affords safety against derailment, and the driving mechanism is capable of producing high speed, the car being cushioned in a simple and efficient manner.

CONDUIT RAILWAY TROLLEY.—Walter E. Delabarre, Francis M. Frazer, and Robert A. Carrick, New York City. The construction of this conduit is such that the main electrical conductor is protected from the action of the weather, and the opening through which connection is made with the car is so located that it will serve as a channel for the flange of the wheels. The trolley is connected to a transmitting arm projecting through the slot, there being secured to the arm a covering of insulated material having at its ends bevels facing in the opposite direction from that of the trolley.

Mechanical.

REAMER.—Foist Hatmaker, Ithaca, N. Y. For the use more especially of plumbers, in the repair of faucets, bibs and similar articles, this inventor has designed a reamer having a hollow handle and adapted to carry a reversible shank formed at one end with a fixed cutter head, while supporting at its other end a reamer with adjustable cutters.

SIDE DRESSING SAW TEETH.—George Fritz, Rib Lake, Wis. This inventor provides a device for use on band or gang saws after they are swaged, to quickly dress both sides of the teeth. It comprises two arms having jaws engaging the sides of a tooth, one of the arms supporting a tooth guide to engage the front and back of a tooth; a guide bolt passes through the arms, and on it one of the arms moves toward and from the other, while a cam lever fulcrumed on the bolt engages the movable arm.

Agricultural.

THRASHING MACHINE.—Isaac W. Woodburn, Rock Rapids, Ia. In this thrasher the power and the machine are mounted on the same wheels, and the engine may also be utilized to move the machine from place to place. The construction is simple, strong, and inexpensive, and the machine is operated without end or side shake, the various rotating cylinders for cleaning purposes, together with the conveyers and air supply, effectually cleaning the grain after it is separated. The machine does not need leveling and setting, and the blower does double duty, drawing the chaff from the grain and expediting the exit of the straw from the machine.

FODDER OR FEED LOADER AND SLED.—Edwin F. Lewis, Vine Creek, Kansas. This is a low-wheeled sled for gathering and carrying hay, and is to be used in connection with a slatted gathering platform or loader upon a single axle, the loader being entered beneath the shock to gather a certain amount of hay and then being carried a portion of its length over the sled, to which the hay is thus readily transferred.

Miscellaneous.

PNEUMATIC BICYCLE TIRE.—Cevedra B. Sheldon, Brooklyn, N. Y. This is a tubular tire whose inner portion may be stretched at one or more points more than its outer periphery, whereby the tire may be readily slipped on or off without collapsing and without the use of special tools. This tire is also armored in an improved manner, to render the tire proof against puncture or penetration, the armor possessing such a degree of flexibility and resilience as not to interfere with these qualities in the tire as a whole.

MOTIVE POWER FOR BICYCLES, ETC.—Julius Tullius, New York City. In the driving mechanism devised by this inventor a sliding pedal shaft projects through a bearing sleeve having cupped ends in which socket plates are fitted and secured to the shaft, there being balls in the bearings formed by the cupped ends and socket plates, and gear wheels of different sizes loosely mounted on the pedal shaft and loosely connected with the ends of the sleeve. By pressing with the foot on either the right or left crank arm with the foot the operator may carry the shaft to the right or left, to change the mechanism for speed or for power, according to the road being traveled.

SEXTANT ATTACHMENT.—Thomas T. H. Ferguson, Hankow, China. By means of this improvement the ordinary sextant may be converted into an instrument for measuring large angles, say from 120 to 240 degrees, as well as angles from zero to twenty degrees. The invention consists principally of a full silvered glass or mirror and a half silvered glass, the latter being substituted for a horizon glass in the plate of the instrument and the mirror being attached to a vernier indicating on a graduated arc.

ELLIPSOGRAPH.—John A. Caldwell, Vancouver, Canada. This is a device to facilitate the drawing of almost any kind of an ellipse. A sleeve is fitted to slide loosely on one of the legs of a compass, a rod adjustable in the sleeve standing at right angles to the leg carrying the sleeve. A holder is held on the rod and in it is adjustably held a second rod in which is pivoted a pen support, a pin being held adjustable on the pivoted support.

MANIFOLDING DEVICE.—Edwin B. Tilton, Brooklyn, N. Y. This improvement consists of a board, cut away for a hand space at opposite sides, and with right angled flanges on adjacent edges, together with projecting pins near one end, affording a cheap and simple contrivance for the use of typewriters, to facilitate the quick and accurate assembling of sheets of paper and carbon sheets.

INK WELL.—William B. Pratt, Rahway, N. J. This inventor has devised a cover attachment which may be applied to an ink well of any description, in such manner that it may be sealed air tight when not in use. The cover is held closed under tension, but the opening and closing may be effected with one hand.

PNEUMATIC GRAIN CONVEYING.—Frederic E. Duckham, Millwall Docks, London, England. This invention relates to former patented inventions of the same inventor, and particularly to the suction inlet nozzle of apparatus for loading, unloading and transferring grain and other granular matters in bulk by an exhaust current of air. The height above the inlet of the nozzle at which the air sleeve should terminate being dependent upon various circumstances, it is necessary to vary the relative positions of the nozzle and its air sleeve. The invention consists in making the air sleeve adjustable with regard to the nozzle, and