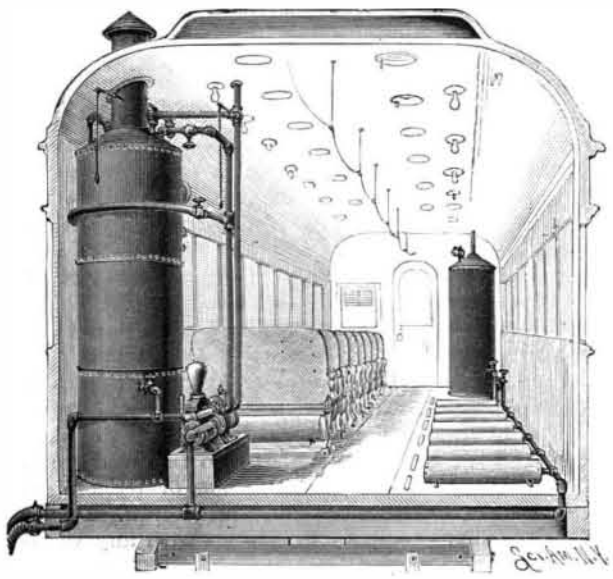
A RAILWAY CAR FIRE EXTINGUISHING APPARATUS.

The illustration represents an equipment for a railway car by means of which fires on the cars, bridges, or at stations or structures along the route may be extinguished. It forms the subject of a patent issued to Mr. William H. Beach, of Winona, Minn. A steam boiler is located in one corner of the car, and in connection with it is arranged a steam pump, the exhaust extending out through the roof, but being connected with the smoke stack of the boiler by a branch pipe. In a diagonally opposite corner of the car is a reservoir and heating drum, connected with the boiler by piping which extends around the car. Beneath the seats of the car, or in any other convenient position, are additional reservoirs, connected with the pipe extending around the car, the latter pipe being also connected with the suction chamber of the pump, while a pipe leads from its delivery chamber to a coupling nozzle. Coupling sections are also provided to effect a continuous circulation throughout the cars of a train equipped with this system. In addition to the coupling nozzle provided for connection with a delivery hose, the pump has a pipe or plug for establishing connection by means of a suction hose with the tank of the tender or any other convenient water supply, when a fire on a structure near the track is to be extinguished, such pipe being also utilized in filling the reservoir. The latter has a heating pipe arranged within it whereby the water may be heated by either the live or the exhaust steam, the necessary connections therefor being controlled by conveniently arranged valves, and when it is desired to pump water from the main reservoir alone the auxiliary reservoirs may be cut off from connection therewith.



BEACH'S RAILWAY CAR FIRE EXTINGUISHER.

AN IMPROVED AIR PUMP GOVERNOR.

The illustration shows a sectional view and the application in position of an air pump governor adapted for use with air brakes, which is designed to be simple and durable in construction and effective and positive in operation. The steam inlet in the base of the governor casing is connected as usual with the boiler, while the steam outlet leads to the pump, as shown by the arrows. The inlet port is adapted to be closed by the reduced end of a hollow main valve in which is a coiled spring, which presses also against a plug screwing in one end of a cylinder above, of somewhat less diameter.

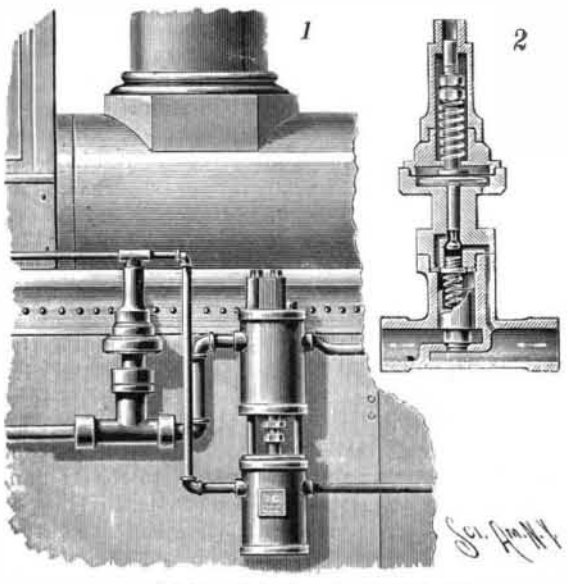
The upper end of the latter cylinder has a valve seat closed by an auxiliary valve on the reduced end of a stem sliding in a cylinder in the upper part of the casing, and of still smaller diameter. The first cylinder of reduced size is connected by a port with the steam inlet, and the smaller cylinder is connected by another port with the upper end of the cylinder in which slides the main valve. The upper end of the valve stem of the auxiliary valve abuts against a disk held in an upper chamber, the disk being held on the lower end of a vertical stem, while on the top of the disk is arranged a diaphragm. The stem projects into an upper cap, an opening from which is connected with the air pipe of the air brake, the upper end of the stem being quite slack, so that air will pass down to press on the top side of the diaphragm. On the stem is a coiled spring, the tension of which is regulated by adjusting nuts, and the lower part of the chamber in which the diaphragm is located is connected by an opening with the outside, to serve as a drip for any water of condensation.

When the diaphragm is depressed by air pressure on its top side, the auxiliary valve is pushed off its seat so that live steam can enter and pass it, then passing into the upper end of the cylinder to press the main valve downward, the total pressure on the top of this valve being greater than that on the bottom, on account of the spring and the weight of the valve, so that the valve starts and moves downward as soon as the auxiliary valve is pushed off its seat. When the air pressure is reduced or taken off, the spring in the upper cap draws the stem and diaphragm upward, when the steam pressure on the reduced end of the main valve causes the latter to slide upward, and communication is established between the steam inlet and outlet.

This governor has no atmospheric exhaust; when the auxiliary valve is closed, the steam, which was holding the main valve on its seat, passes down the sides of the large cylinder into the pump, where it sustains warmth, and the remaining volume will be finally overcome by the pressure acting on the small end, which in opening applies pressure to the whole bottom side of the main valve before it has time to pass up to the top—hence the accelerated opening motion. But it will quickly settle to its working position by the steam in outlet equalizing upward into top end of cylinder, when it acts as an ordinary check valve, simply holding a slightly higher initial pressure on inlet side.

This pressure, if allowed to flow into the top end of the large cylinder by auxiliary valve opening, will cause the main valve to descend, thereby contracting the port opening, causing the pressure on outlet side to drop quickly, and as it is this outlet pressure which acts on part of the lower side of main valve, the downward motion of main valve will be accelerated till it reaches its seat, where the small end alone at the bottom is subjected to the same initial pressure as that which acts upon the whole top area. Hence the positive action.

For further information relative to this invention, address Mr. Craven R. Ord, No. 40 Law Street, West Toronto, Ontario, Canada.



ORD'S AIR PUMP GOVERNOR.

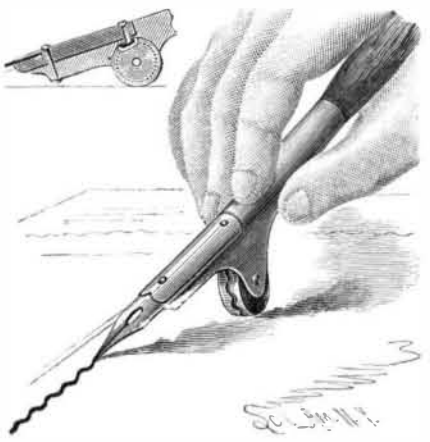
A COMPACT AND POWERFUL FLOORING CLAMP.

The illustration represents a strong and readily operated device to facilitate the laying of floor boards, whether they are straight or warped on their edges. It has been patented by Mr. James H. Giesey, of No. 2235 Chapline Street, Wheeling, West Va. Fig. 1 is a side view of the device secured to a joist in operative position, Fig. 2 being a top plan view in section. The clamp is designed to be self-locking to the joist it is mounted on, the act of pushing the presser bar against the floor board tightening the grip of the device on its support, while its withdrawal releases the clamp. The clamping sections are pivoted in ears of a base plate, limbs of these sections extending below the pivotal points and having adjustable set bolts near their free ends, the inner ends of these bolts being pointed to afford secure engagement with the beam. Above the pivotal points the clamping sections have each an integral arch, and the rear portions of their limbs are curved outwardly and upwardly in opposite directions on each side, producing cam curves on the arch portions, the curved top surfaces of both arches being serrated to produce ratchet teeth. At the center of the base plate is pivoted an operating lever having a sliding locking dog loosely held on the lever to reciprocate vertically a limited distance. The usual tripping handle is jointed to the operating lever, and connected by a link bar to the dog. The presser bar, pivoted upon the operating lever, has a forked front end, each limb of which is bent upward at the edges so that the faces of the limbs will fit squarely over the tongue of a floor board. When this clamp has been made to straddle a joist, and the pointed bolts have been properly adjusted, the pushing forward of the operating lever brings these bolts into engagement with the joist and at the same time moves the presser bar against the floor boards, the locking dog holding the lever at any point of rocking adjustment.

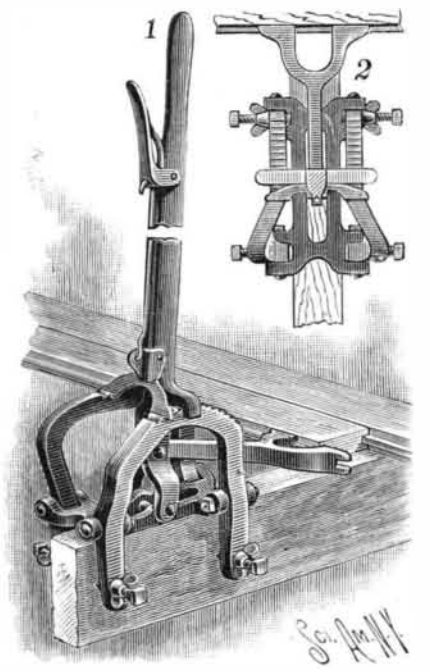
THE surveyors' instruments, drawing appliances, and similar articles manufactured and imported by the Keuffel & Esser Company, of New York City, embrace such a wide variety of goods as to require a catalogue of nearly three hundred pages for their enumeration, with but the briefest description. The firm has been long established, has well earned a high reputation, and conducts a very extensive business.

A PEN HOLDER TO FACILITATE MAKING WAVED LINES.

A pen holder with which waved or irregular lines may be made with facility is shown in the accompanying illustration, and has been patented by Mr. George H. Richardson, of Old Town, Me. This pen holder is made in two parts, the front portion, carrying the pen, being pivoted near its forward end to the forward part of the main portion. The latter carries a wheel or roller which rests on the paper as the instrument is moved along, and on the periphery of this wheel is a zigzag groove corresponding to the waved line or lines it is desired to produce on the paper. A stud or pin at the rear end of the pen-carrying portion of the holder, as shown in the sectional view, engages this groove, and causes the pen to vibrate as the wheel revolves. The device is designed to be especially useful to draughtsmen and others in making fancy borders, as well as in ruling checks, drafts and other papers in business offices.



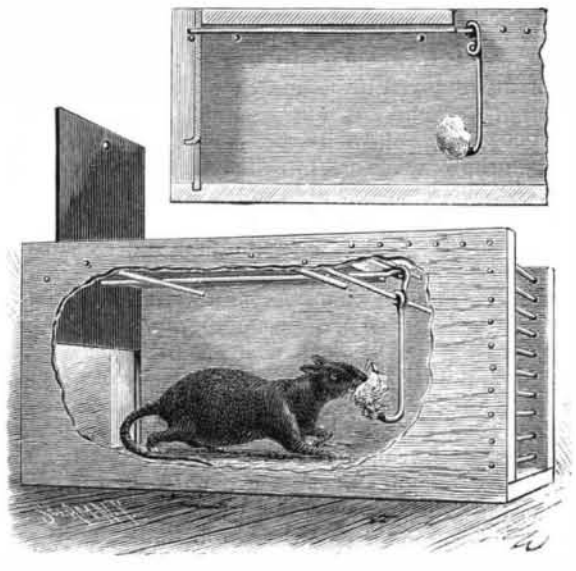
RICHARDSON'S PEN HOLDER.



GIESEY'S FLOORING CLAMP.

A SIMPLE AND RELIABLE TRAP.

The accompanying illustration represents a trap, patented by Mr. Walter Pead, of Durban, Natal, South Africa, adapted to catch animals alive, and which may be made strong enough to capture wild animals of various kinds. One end and a portion of the top of the box is closed with wire rods, admitting light, so that the bait can be readily seen, and at the opposite end of the box are grooves for the reception of a sliding gate, of metal, and of sufficient weight to assure its quick descent when released. The bait hook is pivotally suspended on a transverse wire rod, and an



PEAD'S ANIMAL TRAP.

eye is turned on the upper end portion of the hook to receive a hook on a longitudinal trigger bar supported to slide on transverse rods near the top of the box. In the sliding gate are two small orifices, one of which aligns with the trigger bar when the gate is raised, and the other when it is closed, and on the outer face of the gate are two projecting lugs, which strike against a stop bar, limiting the upward movement of the gate, this bar passing through the side walls of the box in the same plane with the trigger-supporting rods, and the bar also holding loosely the extremity of the trigger bar, as shown in the sectional view. When the bait is placed in position on the hook, the trigger bar is passed through the lower orifice in the gate in such way that the weight of the raised gate will rest on the extreme end portion of the rod. On the touching of the bait by a mouse or rat, or other animal, the end of the trigger bar is dislodged, and the gate released, falling behind the animal, the end of the trigger bar then entering the upper hole and locking the gate shut.

For further information relative to this invention address Messrs. Arkell & Douglas, Kemble Building, No. 15 Whitehall Street, New York City.

Mapping the Southern Sky from a Mountain Peak 14,000 Feet High.

Upon various mountain peaks in the heart of the Andes, from 4,500 to 14,000 feet above the sea, there have been in use for nearly two years past two portable houses, built in Boston in the fall of 1888, and forming the home of a corps of scientists from Harvard University. They are making a map of the southern heavens, after a plan similar to that of mapping the northern heavens, which has been in progress at the university observatory for some years. The first expedition for this purpose was formed late in 1888, led by Professor S. I. Bailey, with his brother, M. H. Bailey, as first assistant. It set out in February, 1889, and among the equipments were the two portable houses and such photographic and meteorological instruments as would be necessary for accurate observations. Upon arriving in Peru and spending several weeks in looking over the country, Prof. Bailey selected as an observatory a mountain summit, 6,650 feet high, eight miles north of Chosica and twenty-six miles inland from Lima. This location was deemed high enough to be always from 1,000 to 3,000 feet above the fogs of the coast, and far enough from the interior to escape its rains. The portable buildings were put up, and three other small houses were built for the assistants and servants. The summit was named Mt. Harvard, and observations were begun in May, 1889.

The instruments used for observation were a photographic telescope of eight inches aperture, a meridian photometer, a six inch field glass, and various meteorological and other instruments. At the end of four months much success had been attained. The plan followed was to cover the entire sky from 15° to the south pole four times, once with photographs of spectra having an exposure of an hour, which included stars to about the eighth magnitude; secondly, with an exposure of ten minutes, giving the brighter stars; thirdly, with charts having an exposure of an hour, permitting a map of the southern stars to the fourteenth magnitude inclusive; and, fourthly, with charts having an exposure of ten minutes, including stars to the tenth magnitude. The meridian photometer may be described as a double telescope instrument, especially constructed to make a more accurate measurement of the magnitude of stars than had previously been attempted for the southern heavens. This instrument was also used with great success.

During September and October, 1889, the sky became so cloudy that a new location of the observatory was made January 6, 1890, at Pampa central, on the Atacama desert, with an elevation of 4,535 feet. Late in February, the expedition returned to Mt. Harvard, where it has remained until news was received, on January 3 of this year, that the observatory had been removed to Vincocaya, in the neighborhood of Arequipa, with an elevation, according to a report of the Boston *Herald*, of 14,110 feet.

This removal was not a sudden one, but had been contemplated for some months. Prof. Bailey was undoubtedly annoyed by clouds, as he had been in the winter of 1889, and has simply sought a new permanent location southward, where the average of cloudless sky through the year seemed to be much larger than at Mt. Harvard, Chosica.

The press dispatch which brought the news of the removal of the observatory said that the expedition was soon expected to be joined by a new expedition from Harvard with the most improved instruments. One of the latter is a new photographic telescope, which cost $50,000. This telescope is of 24 inches aperture, and will take the place of the one of 8 inches aperture which Prof. Bailey has been using. The instrument, when placed in position, will be principally used for the study of the distribution of the stars, for complete catalogues of cluster, nebulæ, double stars, and for the spectra of faint stars.

The plates as now taken by Prof. Bailey, with the small instrument in his possession, have to be enlarged three times for the maps. With the new instrument the same results will be attained in the original photographs without enlargement. The new instrument is known as a photographic doublet, and its use will, undoubtedly, produce the most successful and interesting results.

Teeth Germs in Infants.

The development of teeth germs from infancy to mature life, a writer in the Pittsburg *Dispatch* thinks, is one of the most interesting phases of human growth. Pass the finger along the tiny jaw of the newcomer. Not only is there nothing which presages future teeth, but the jaws themselves seem too delicate and frail to become the sockets for such hard-working portions of the anatomy. Yet we are assured that there are fifty-two teeth germs hidden there. Twenty of them are for the temporary teeth, with which in due time the child will begin to gnaw or chew his way through life; the others include the permanent set and the molars, none of which begin to make their presence known until the child is six years old, and the "wisdom" teeth do not usually appear until about the age of eighteen.

The little pulp germ grows and develops till it approximates the shape of the tooth it is to become; then it begins to calcify, forming the dentine part of the crown, while the enamel is deposited by an independent process. The surface of the crown attains its full size before the process of elongation commences. Then gradually it pushes its way outward through the gum, absorbing its tissue as it advances till the pure white enamel peeps out, to the mother's great delight.

The process of "teething" is invariably one of disturbance, especially if the outer membrane or skin of the gum proves tenacious. In this case it should be lanced—an operation which is humane, in that it relieves the discomfort of the child, and is entirely harmless, as there is seldom any hemorrhage worth the name, and if there should be a slight flow of blood it readily yields to simple treatment. The application of a dust of powdered alum is usually sufficient.

Hints to be Heeded.

The Western Manufacturers' Mutual Insurance Company and the Factory Mutual Underwriters' Union have issued a circular which should receive the special consideration of every manufacturing concern, and storekeepers and householders will do well to regard some of the many good hints embodied in the circular.

Special attention should be given at this season of the year to protecting fire apparatus against cold weather during the winter, and to ascertaining that all appliances are in order, and everything in its proper place, so as to be able to extinguish a fire, should one occur, with the smallest possible loss. As defective stoves, furnaces, stove and steam pipes, chimneys and other flues are the most prolific source of fires, they should also have proper attention at this season of the year, when they are about to be put in constant use for the winter months.

In this precautionary work for the winter all hydrants and valves should be carefully examined and oiled, preferably with heavy mineral oil, which will not corrode the brass. All hydrants and standpipes and all branch hydrants should be opened after the pipes are emptied, to let out any entrapped water, which may have leaked past the valve when the pipes were full, and care taken that all the drip valves are in good condition.

The rotary pumps should be oiled, and if exposed to freezing, turned backward to empty them of water. Pipes exposed to freezing should be emptied, and care taken to let the water out from above the check valves. All valves should be marked with an arrow, showing the proper direction to open them.

In all buildings equipped with automatic sprinklers, where it is impracticable to keep the buildings or rooms warm enough to prevent freezing, the system should be changed to an approved drypipe system. It is very important that some reliable person or persons should be put in charge of the fire apparatus, and that they should know the working of the same, and that every part is in order, and they can be sure only by making a thorough inspection as often as once a week. A fire organization among the employes is essential to the handling of the fire apparatus.

Buckets of water are the most effective fire apparatus, as any person can handle them. They should be kept full and distributed in abundance through the various rooms or floors of nearly all risks other than dwellings. They may be placed on shelves, or hung on hooks, as circumstances may require. Galvanized iron or indurated fiber pails are better than wood. They should be marked "For fire only." Casks of water are generally needed to furnish a further supply to the fire pails. To prevent freezing, add chloride of magnesium or salt to the water.

Stoves should be in order, and free from cracks, set firm on metal legs, and floors underneath should be protected by zinc or stone, or inclosed with scantling nailed together and filled with brick and mortar or cement. They should not stand nearer unprotected wood work than three feet. Any wood work nearer than three feet should first be covered with asbestos paper, and then covered with tin, or protected in some other equally safe manner. A good guard is made of gas pipe securely screwed to the floor, and should be placed about stoves where there is a liability of stock being piled against them in manufacturing establishments.

Ashes should always be placed in a fireproof receptacle when taken from stoves and furnaces.

Stove pipes should be thoroughly cleaned and all unsound lengths replaced by new ones. All stove pipes should enter good brick chimneys and should enter the chimney horizontally, with but one elbow. In all mills and factories where there is considerable vibration, or where dust is liable to accumulate, the horizontal pipe lengths should be carefully riveted together and an additional pipe placed outside, leaving at least one inch airspace between the inner and outer pipes, supported at frequent intervals by wires, also well wired to hold it in the chimney. In all cases where pipes pass through wooden or lath and plastered partitions, there should be a double collar of metal, with from two to four inches air space, and holes for ventilation, or at least eight inches of masonry about it.

The chimneys should be examined carefully, especially where they pass through floors and roofs, as the settling of the building may cause cracks that would let sparks escape. A long-bladed case knife serves well as a probe for this purpose.

All pipe holes not in use should have close-fitting stoppers. There should be no woodwork of any kind framed into the chimney, and the entire surface of the trimmers and headers next to the flue should be entirely covered with tin or light sheet iron.

Where steam pipes pass through floors or partitions, the woodwork should be cut away from around the pipe at least two inches, and covered with asbestos paper, and then covered with tin. Cut a V-shaped piece out of the tin where it passes through the wood on both sides, and nail securely to the woodwork. The pipes should be supported by gas or steam pipes, earthen rings, or other equally safe material. Do not permit the pipes to come in contact with any woodwork or other inflammable material.

The Electric Motor's Work.

The New York *Sun* thus speaks of electric power, in which the work of the motor is summed up as follows:

"In some cities, so far has the use of electric motors gone, that it is possible for a man to-day to drink at breakfast coffee ground and eat fruit evaporated by electric power. During the morning he will conduct his business with electrically made pens and paper ruled by electricity, and make his records in electrically bound books, his seventh story office, in all probability, being reached by an electric motor elevator. At luncheon he will be able to discuss sausages, butter, and bread, and at night eat ice cream and drink iced water due to the same electrical energy. He will ride all about the place in electric cars, wear shirts and collars mangled and ironed by electric motors, sport in a suit of clothes sewn and a hat blocked by the same means; on holidays ride a merry-go-round propelled by an electric motor, or have his toboggan hauled up the slide with equal facility; be called to church by an electrically tapped bell, sing hymns to the accompaniment of an electrically blown organ, he buried in a coffin of electric make, and, last of all, have his name carved on his tombstone by the same subtile, mysterious, all-persuasive and indefatigable agency. This may sound like a wild and exuberant flight of fancy, but it is simply a faithful statement of the manner in which electricity is being applied to every one of the necessities and luxuries of life in America."

Maple Sugar.

In a paper read before the American Association on "The Indian Origin of Maple Sugar," by Mr. Henry W. Henshaw, of Washington, the point was as to whether the Indians learned to make sugar of the whites, or *vice versa*. The argument drawn from the maple tree festivals and linguistic evidence showed the red men were in no way indebted to the whites for sugar, no more than for the cultivation of corn, the pumpkin, bean, and tobacco. Their simple process was aboriginal, resulting from their own observation and inventive powers. They collect the sap in birch-bark vessels. These hold in some cases a hundred gallons. They take advantage of cold April nights to freeze the sap, and in the morning throw out the ice. They evaporate it by throwing hot stones into the reservoirs of sap. The sugar is eaten mixed with corn. Sometimes the pure sugar is their only diet for a month. They boil venison and rabbits in the hot sap as they evaporate it. They also make sugar from the silver maple and box elder. That the Indians made sugar from times unknown is proved by their language, their festivals, and their traditions. Several authors of early times, telling of their visits to the Indians, mention maple sugar, and one of them, in 1756, describes the Indians' mode of preparing it. The gathering of sap and making of sugar formed one of their annual religious ceremonies.