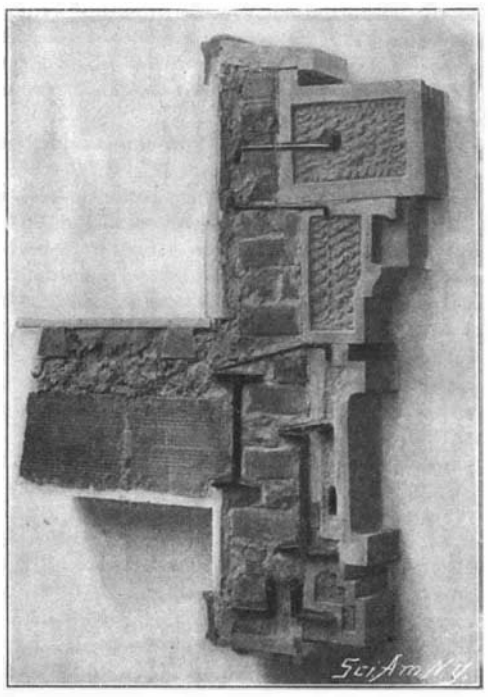
## "BROADWAY CHAMBERS."—EXHIBITS AT THE PARIS EXPOSITION.

In the United States section of the Civil Engineering building is an extensive exhibit showing the construction of a modern office building, as exemplified by the "Broadway Chambers," one of the large buildings recently erected in New York. The exhibit, made by Geo. A. Fuller & Company and the sub-contractors, is intended to show the revolution which has taken place in America within the last few years in constructions of this kind, and at the same time the rapidity with which the construction may be carried out. Owing to the use of the steel skeleton which forms the framework of the building, the masonry need not be as massive as that formerly used; in fact, the walls serve mainly as a protection against the weather and for architectural beauty, and the stability of the building depends entirely upon the steel frame.

The exhibit shows the construction of a building of this kind in a very complete manner. As will be seen in the illustrations, a model shows the skeleton frame and a plaster model shows the appearance of the exterior. This skeleton frame was illustrated fully in the SCIENTIFIC AMERICAN of May 12. In the rear of the exhibit is a full-size model showing the terra-cotta finish of the upper stories. A number of full-size sections illustrate the methods of construction of all the essential parts of the building. The engine and dynamo for the electric lighting, with the switchboard, are also shown.

A view of the metallic model is seen in one of the illustrations, showing a modern steel frame complete, with all its details. To support the framework, a layer of cement 30 inches thick is placed upon solid ground, and upon this rests the grillage, composed of I beams placed side by side and crossed in two or more layers. From this the main posts rise to the top, joined laterally at each story by the main cross-beams with their floor-beams. The iron work is entirely protected by blocks of porous terra-cotta, completely incombustible. The main posts are generally constructed of channel bars and flat plates riveted together by Z iron with plates, or of trellis work, according to circumstances. The main cross-beams are generally I or channel iron; as will be noted, the corners of the building are reinforced by gussets. At each story the skeleton frame is surrounded by angle-iron, which serves to support the facing. All the iron or steel parts are specially treated; they are first well cleaned to remove all traces of grease or dust, then given a coat of pure linseed oil, and afterward two coats of metallic paint; after erection they are given a thick coat of silicious and graphite paint. To the left of the illustration will be noticed a full-size section of one of the main columns, showing how it is surrounded by terra-cotta, with the holes for the various pipes and conduits, and the exterior finish of plaster. To the right are two full-size models showing the method of joining the beams.

The roof is constructed in the same way as the beams of the main stories; it is covered with a water-proof layer, then with cement covered with terra-cotta tile. The steel model shows in miniature the arrangements for heating and ventilating, plumbing, elevators, etc. The heating system is carried out upon the most improved plan; it is capable of maintaining a uniform temperature of 70° F. when the outside is at 0° F. The radiators utilize the steam which has just served for the electric lighting and other power of the building, and which would be otherwise lost. When at very low temperatures this is not sufficient, it is supplemented by a direct admission of steam from the boilers, carried out by a pressure-reducing regulator which enables the boilers to feed the steam-heating system without losing pressure. The main steam-pipes rise from the basement to a space between the last story and the roof, and from these are connected horizontal branches which then descend vertically to supply the radiators in the different stories. This system is clearly shown in the model by miniature colored pipes. There are two Clonbrock boilers in the basement, which are connected with a chimney 240 feet high and over three feet in diameter; the boilers, of the water-tube type, are also shown by models. All the exposed parts of the boilers and steam fittings are protected by a magnesia covering 1½ inches thick. The engine, of the Payne type, has a capacity of 100 horse power, and is direct connected to a Bullock dynamo which can supply 650 lamps. The current passes to a distributing switchboard, which controls all the lamps in the building.



SECTION OF SPANDREL, SIXTEENTH FLOOR.

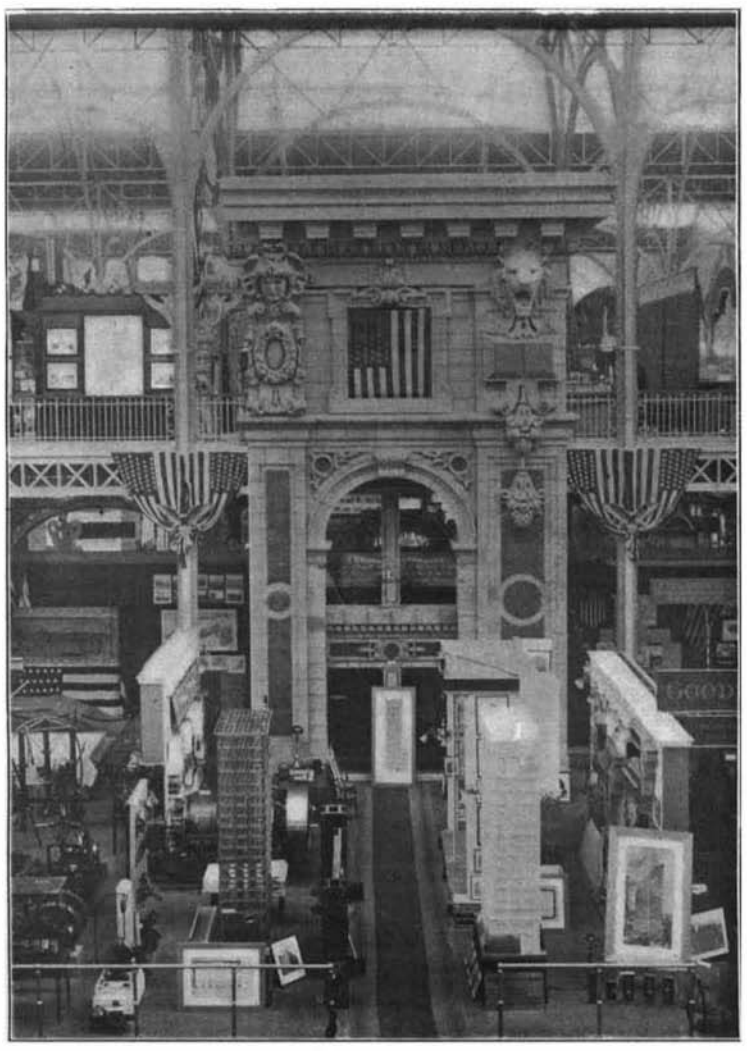
The plumbing and drainage systems are carefully carried out; they have been installed according to the New York Health Department rules. The hot and cold water pipes are tested at a pressure of 150 pounds per square inch. There is a complete fire system, connected directly with the street mains and fire pump, including pipes, valves and hose. The roof, drainage and ventilating pipes which lie above the soil are in galvanized wrought iron, with screw joints. The tubes exposed to view in the washstands and closets are of copper, nickel-plated; these copper tubes are made without soldering and annealed, hard metal tubes being excluded from the building. The model also shows the four large hydraulic elevators of the Otis type which give access to all parts of the building; one of them is caused to mount and descend by a small electric motor arranged for the purpose.

The plaster model shown in one of the illustrations gives a good idea of the exterior of the building; it has been made to a scale of one-half inch to the foot, the actual height of the building being 230 feet. The façade is of granite from the ground floor to third story, in hard brick from the third to the fourteenth story, and in terra-cotta to the top. The courses of brick have been arranged to give horizontal lines and diminish in this way the appearance of height. The full size model in the rear of the exhibit is a reproduction of a portion of the upper stories as they actually exist in the building. The general color of the terra-cotta is buff relieved by polychrome panels. The terra-cotta is hard, nearly vitreous and quite non-absorbent; the joints are carefully filled and covered to prevent moisture from entering.

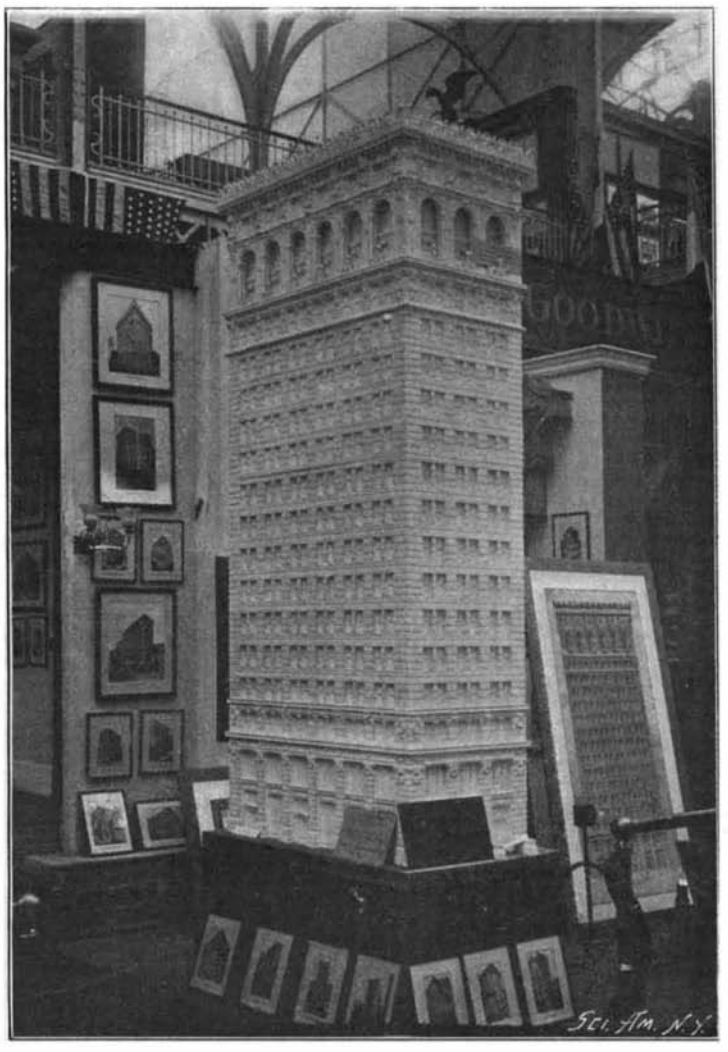
The full size section exhibited shows the general arrangement of the offices and the incombustible construction of the walls and floor, also the disposition of the various conduits. The principal corridors, as well as the ground floor and the banking floor, are finished in marble, and the remainder in cement or tile. In the section will be seen the main beam in the rear and two of the floor beams; between the latter is laid the floor; this, with the exception of the second basement, is composed of arches formed of hollow blocks of terra-cotta ten inches thick. Above these is a layer of beton formed of cement mortar and broken terra-cotta; in this are laid the wood sleepers, as shown, and to these is nailed the floor planking.

Another full size section is that showing a portion of the front of the building, in which the construction is clearly seen. The terra-cotta pieces forming the front are attached by anchors to the main beams of the building. The ceiling of one story is seen below, with the top of window, then the arrangement of the floor, the terra-cotta blocks, sleepers and planking and a portion of the wall of the upper story, with the interior finish and window-sill.

The exhibit contains a number of photographs of this building, and of similar buildings erected on the same system in different cities, notably in Chicago. A set of progress pictures taken during the construction of the "Broadway Chambers" shows the rapid progress which may be made with this construction; the building was completed within seven months after the ground was broken. The building was designed by Mr. Cass Gilbert, architect, with Purdy & Henderson as consulting engineers. The Paris exhibit is ably superintended by Mr. Robert E. Fuller.



FULL-SIZE TERRA-COTTA SECTION OF "BROADWAY CHAMBERS."



PLASTER MODEL OF "BROADWAY CHAMBERS" AT THE PARIS EXPOSITION.

IN Cologne all automobile vehicles must be provided with a number large enough to be read at considerable distance, and every operator must have a certificate issued by the police authorities. Bells must be used instead of signal trumpets, and the vehicles must also have two brakes.

### Some Famous "Nefs."

The late Duke of Saxe-Coburg indulged in many curious and artistic hobbies, one of the most enthusiastic of which was the collection of antique "nefs," or small models of ships executed in silver. These quaint yet valuable specimens of the silversmith's handiwork are, unfortunately, very rare. The British Museum, at London, does not possess a single example, and the South Kensington Museum is but indifferently represented. The Czar of Russia possesses what is generally believed to be the finest "nef" extant, presented by Queen Elizabeth of England to the then Czar. Yet the late duke possessed a collection of more than forty "nefs." Naturally, he was an expert in connection with this unique craft, and he always displayed a keen delight in exhibiting his specimens to his friends. His collection is undoubtedly the largest and finest in existence, since it includes some of the most beautiful specimens that have been manufactured in the sixteenth, seventeenth and eighteenth centuries. Curiously enough, very little is known regarding the early history of these curious craft, but in the olden days such models were frequently presented by one royal personage to another. Their avowed purpose was to constitute a table ornament and a receptacle for wine. They were constructed with the greatest care and skill, and unstinting pains were taken by the smiths to render them faithful in design even to minutest details of the vessels of which they were the models. As historic relics they are of inestimable value, since the rigs and characteristics of the battleships and merchant vessels of the various periods, being absolutely correct, render them far more reliable for reference than any amount of drawings or prints.

The public had an opportunity of inspecting the duke's collection in London, in 1891, at the Royal Naval Exhibition, in which they constituted a conspicuous feature in the Loan Art Section. The models displayed were all magnificent examples of old French, old Dutch, Nuremberg, or Augsburg handiwork, and were freely embellished with intricate and beautiful detail. One of the finest, also the largest, was a model of the "Felicitas" made at Nuremberg. The vessel is three-masted and is executed throughout in parcel gilt. She is shown under full sail with fighting tops on the masts, while a triumphal procession of Neptune and the sea gods is delicately chased in the silver hull. As an example of the enormous skill that was devoted to the work to render the model a complete vraisemblance of its prototype, there was a smaller craft, upon the deck of which were grouped the sailors, soldiers, men, and women, while guns are shown on the decks and others with their muzzles projecting from the portholes. One, hailing from Augsburg, is mounted with twelve silver cannon, has the head of Pan at the bows and a flag flying at the stern. The hull, as in most of the other vessels, is inscribed with a design. In this case it is sea nymphs bearing the inscription "Clytus Rex Oceanus." Reality is further imparted to this specimen by the sailors represented at their duties in the rigging. Not long before he died the duke added another valuable example to his collection. This model portrayed a battle between Vasco de Gama, the explorer, and black warriors, probably depicting some incident that occurred on one of his voyages.

The friends of the late duke, knowing the unbounded enthusiasm he evinced in collecting these nefs, were always ready to inform him where other models might be obtained, and the duke never regarded any price that might be demanded as prohibitive, since he was perfectly aware of the immense intrinsic value of these diminutive craft. When the duke celebrated the twenty-fifth anniversary of his connection as one of the Brethren of Trinity House, his colleagues of that corporation presented him with one large model, nearly two feet in length, of a trader, made in Nuremberg in 1850, which he greatly prized.

The manufacture of these nefs appears to have long since fallen into desuetude. Their cost was great, which fact no doubt served to render them prohibitive except to the most ardent collectors, and this fact probably accounts for their great scarcity. The craft was somewhat revived some years ago by two models which were manufactured of the English ships "Britannia" and "Victoria," which were presented to the Queen of England by the Royal Navy and Marines on the occasion of her Jubilee in 1887. For the modeling of the first-class battleship "Victoria," which was sunk by collision with the "Camperdown" in the Mediterranean some years ago, a set of exact drawings were prepared. Some idea of the fineness of the work required on this occasion may be gathered from the fact that each gun of her Nordenfelt armament, though it contained no less than one hundred and eighteen pieces, only weighs half an ounce, and can be placed upon the ordinary English florin, which is only about one inch and a quarter in diameter.

There is much speculation as to what will become of the duke's collection of these nefs, but it is suggested that they should be presented to the English nation as a memorial of one who devoted so much of his time to the English navy, and to whom the welfare of the personnel of which was constantly at heart. At present the collection rests in large glass cases at the late duke's residence, Clarence House.

### October Building Edition.

The Building Edition of the SCIENTIFIC AMERICAN for October is a particularly handsome number. The colored cover illustrates a model dwelling at Montclair, N. J. Among the other interesting features of this edition are the Music Pavilion, Golden Gate Park, San Francisco, Cal., "Some Italian Towers," which portray in an artistic manner a number of Italy's finest monuments, and a number of interesting houses, as well as a simple summer cottage at Deal Beach, and a modern stable.

### The Current Supplement.

The current SUPPLEMENT, No. 1293, has many interesting articles, including a number of important addresses, as the "Inaugural Address of Prof. Sir William Turner," "A Report of the International Psychological Congress," "The Opening Address of the Department of Astronomy," by Dr. A. A. Common, "Mechanical and Technical Education in the United States," by Prof. C. F. Chandler. "The Automobile in Modern Warfare" is a fully illustrated article, showing many interesting types. "The Nobel Prizes for Scientific Discoveries" gives the complete rules and regulations for this competition. "The Last Day of a Farm House at Pompeii" is a most highly interesting archæological article.

### Contents.

(Illustrated articles are marked with an asterisk.)



## RECENTLY PATENTED INVENTIONS.

### Hospital Appliances.

INVALID-BED AND LIFTING DEVICE FOR HOSPITAL-BEDS.—DR. ELBERT E. MUNGER, Spencer, Iowa. Medical men and nurses have long sought a bed so constructed that it could afford the patient every personal comfort and at the same time serve as an assistant to the nurse or attendant, so that the patient, regardless of the cause or nature of his illness, could be easily nursed without undue labor. Beds have been devised which have met some of these requirements. The Munger invalid bed is designed to meet them all. Dr. Munger's invention consists briefly of a strong bed-frame with an ordinary woven-wire spring-mattress, the frame of the latter being transversely pivoted near the center. The movement thus rendered possible permits a depression of the head and trunk in cases of narcosis, or elevation to a semi-sitting posture. When the patient is swung to an upright position, a downward sliding is prevented by a seatboard placed between the hair and woven-wire mattresses. To the seat-board two foot-pieces are attached, each working independently and so adjusted that one or both of the lower limbs may be placed at any desired height without regard to the position of the trunk. A longitudinal central slot in the hair-mattress permits the introduction of a bed-pan. The bed is further supplied with lateral, revolving, side bars or shafts to which broad bands may be attached. The bands are to be passed beneath the patient to raise him in order to facilitate change of bedding. With this bed, fractures followed by long confinement may be treated. With the seat-board in position, the bed may be readily converted into an upholstered chair form and the patient relieved of the strain of a long-continued lying posture. The simplicity of this bed's construction and the ease of operation earned for it a medal at the Paris Exposition, although it had not been the inventor's intention to compete for any prize.

### Agricultural Implements.

HAY-RAKE.—JAMES H. HUGHES, Alicel, Ore. This horse hay-rake is so constructed that the teeth can be adjusted to or from the ground and held normally from the ground through the medium of a tension device connected by a lever with the head of the rake. When the lever is not in engagement with a rack provided to hold it in certain positions, the tension device will sustain the rake-head in an upper position. Mr. Hughes has made and sold a number of his machines. The invention has proven a practical success.

BAND-CUTTER AND FEEDER.—WALFRED C. PETERSON, Geneva, Neb. By means of this device, the feed of the cylinder and concave are automatically governed and are of such character as to render it impossible for an excess of material to clog the cylinder. When such a condition is likely to prevail, the bundle-carrier and feed-roller employed will instantly and simultaneously stop, being automatically set in motion again as soon as the conditions are normal. Knives are provided for cutting the bands. These knives have a drawing motion in the direction of the cylinder, so that the straw cannot be wrapped around them or their carriers.

### Mechanical Devices.

BARREL-OPENER.—JOSEPH A. BERONIO, Memphis, Tenn. The purpose of this invention is to provide a device for removing the top hoop of a barrel, which device can be used with equal facility whether the head be in the barrel or not. The device consists of a hand-lever, provided with a hook adapted to engage the hoop. The lever is fulcrumed on a link carried by a foot designed to rest on the barrel-head.

ORE CRUSHER AND AMALGAMATOR.—LOUIS JACQUES, Telluride, Colo. The ore crusher and amalgamator comprises a sliding and rocking muller movable in a mortar. As the muller approaches the end of the mortar, it will be so tilted as to leave a space between its bottom and the ore on which it is operating, so that the ore is washed underneath by the water in the mortar. The metal crushed and washed ont of the ore is gather d in the mercury box with the mercury.

VARIABLE-SPEED GEAR.—ERNST LANG, Brussels, Belgium. The gear is of that class in which there is provided an expanding pulley whose diameter can be gradually varied. On a rotary disk levers are pivoted, provided with belt-engaging devices and means for turning the levers to move the belt-engaging devices toward or from the axis of the disk.

### Railway Contrivances.

JOINT FOR PORTABLE RAILWAYS.—ALPHONSE H. AILLOUD, Merida, Mex. This joint for portable railways is designed to decrease the amount of material used in each section without, however, diminishing the strength of the structure, and at the same time to reduce the cost and price of workmanship to the manufacturer without prejudice to the quality of the product. The improved joint has all the merits of the so-called "hybrid" joint with none of its defects, and is adaptable to curves, switches, crossings, turn-plates, and other rail accessories.

SEAL-LOCK.—HENRY M. GROVER, Wallingford, Vt. The seal-lock comprises a keeper engaged by a latch provided with a seal-receiving depression. A bolt locks the latch and keeper together, the seal being held in place by the keeper and the latch engaging with its periphery. It is impossible to pick or open the lock without first breaking the seal.

NUT-LOCK.—HON. J. D. DOWELL and LAWRENCE M. GALLIHER, Mineola, Tex. The lock consists of a flat base plate having an arm extending from one corner, offset to a different plane, bent over with a gradual curve, and returned to the base-plate upon the opposite side from which it started. The construction gives elastic spring to the notched arm, adapts it to nuts of different sizes, and reduces the cost of manufacture.

### Vehicles and Their Accessories.

MOTOR-VEHICLE WHEEL.—CALEB G. ENSIGN, Madison, Ohio. The wooden hub of the well-known Sarven wheel carries the box, and the peripheral surface of the hub is covered with metallic bands bolted together at their flanges, the bolts passing through the joint of the adjacent spokes. The use of this wheel on motor-vehicles necessitates some changes to prevent the loosening of the hub and of the flanges. To avoid these dangers and to construct a wheel in which the metallic box and the metallic covering of the hub are firmly united to give rigidity to the wheel is the object of the invention.

WHEELBARROW.—JASPER B. WILLSEA, Denver, Colo. The handles or side bars of the wheelbarrow have their forward ends curved upward and forward to form striking-bars and to support the edge or flange of the tray. The wheel has its axle-bearings in the side bars between the ends of the body or tray. A hood in the body extends over the wheel to prevent contact of the load with the wheel. The wheel is so arranged that the load upon the handles is partly counterbalanced, thus relieving considerably the pressure on the handles.

DRAFT-EQUALIZER.—JOHN F. SMITH, Parker, S. D. This draft-equalizer comprises a main lever having a long arm projecting on one side of its fulcrum; a second compounding-lever arranged closely to the first and provided with an enlarged head fulcrumed behind the first-named lever. A link connects this lever immediately behind its fulcrum with the outer end of the main lever-arm. A draft-lever is attached to the end of the rear or compounding-lever and is arranged on the opposite side of the fulcrum of the main lever from its long end. The invention is distinctive in its simplicity.

AXLE.—WILLIAM C. DALZELL, Egremont, Mass. The invention relates particularly to axles for vehicles in which the wheel-spindle swings on the axle, as in automobiles; and the object is to provide movable hard-metal bearings with simple means for adjusting the bearings as they become worn. The means in question consist merely of a king-bolt which serves as a pivot for the spindle, and a nut which screws on the bolt and serves to take up the wear. The adjustment can be made without removing the wheels or spindles.

### Miscellaneous Inventions.

LETTER-SHEET.—SPENCER CLAWSON, Salt Lake City, Utah. The inventor has provided a letter-sheet and envelop so combined that a letter may be written and the sheet conveniently severed from the envelop, so as to be placed therein, the object being to promote convenience in the conduct of extensive business correspondence, and especially in connection with type-writer work.

DIGESTER.—EDGAR G. MURPHY, Sandy Hill, N. Y. Wood-pulp digesters used in making paper have been made with linings of cement extending in an unbroken layer. By reason of their expansion and contraction, such linings readily crack. The essential feature of the present invention lies in the building of the digester-shell with butt-straps having inwardly-projected portions, at the sides of which the cement lining is placed in separate and independent sections, the butt straps performing the double function of protecting the seam in the shell and of breaking the continuity of the cement.

DOOR-LOCKING DEVICE.—INGWER F. REDLEFSEN, Texarkana, Ark. Mr. Redlefsen has devised an ingenious method for simultaneously unlocking or releasing a number of doors, such as sliding-doors for cars, residences, barns, cells, or the like. The principle of the invention lies in the use of compressed air or steam for operating the latches of the doors. The steam or air can be controlled from any desired point.

PICTURE-FRAME.—HERMAN DAVIDSON, Manhattan, New York city. To provide a simple means for securing the back of the frame is the object of this invention. The back has a spring-yielding peripheral flange adapted to enter underneath the flange of a retaining-strip extended along the upper portion of the sight-opening of the frame. The back has spring-yielding engagement with a clamping-strip arranged along the lower portion of the sight-opening.

SUPPORT FOR MINERS' LAMPS.—CHRISTIAN J. HECKEL, Pittsburg, Penn. The support comprises a wire frame bent to fit upon the miner's cap, and provided with an eye to receive the hook of the lamp. A segmental guard projects horizontally forward between the members of the frame and in front of the eye. The lamp-body rests in a socket on the lower portion of the frame.

BUTTON.—HENRY HIRSCHBACH, Manhattan, New York city. The button consists essentially of a head and a shank made in two sections pivoted together. The pivoted section is forced into the garment and swung into a right-angular position relatively to the other section, to prevent the withdrawal of the button. The sections are locked in their relative positions by spring-jaws.

LOCK.—HENRY L. KELLOGG, Stevens Point, Wis. This invention is a combined lock and door-knob. The lock has very few parts, thus reducing the cost of manufacture, and is not likely to get out of order. The lock is easily placed in a door, merely by cutting a mortise in the wood.

QUILTING-FRAME.—LUCINDA A. WOLFE, Webb City, Mo. The quilting-frame is of that class which are adapted for self-support upon the floor and for lateral adjustment for taking up a quilt as the sewing progresses. In this invention means are provided for adjusting the parts on which the side or quilting-carrying bars are supported, and for adapting the principal parts of the apparatus to be detached from one another, so that they may be packed or stored in small space.

HOSE-COUPLING.—RUFUS WILLIAMS, Walla Walla, Wash. In this device the coupling-collars may be reciprocally used—that is, either can be screwed on the ferrule of the other abutting section of hose—so that time otherwise lost in selecting the right collar will be saved, which is especially desirable at a fire or on other occasions when quick attachments are necessary.

PROJECTING APPARATUS.—FRANK J. ADAMS, Manhattan, New York city. Mr. Adams has hit upon the novel idea of employing both incandescent and arc lights in his apparatus, with the result that he secures good definition in the projected picture, and obtains a mellow light. The highly-illuminated object in the rear of the casing is refracted by the lenses so as to appear in its natural colors, the lenses being protected from the lamps since the latter are grouped around the casings of the lenses.

NOTE.—Copies of any of these patents can be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.