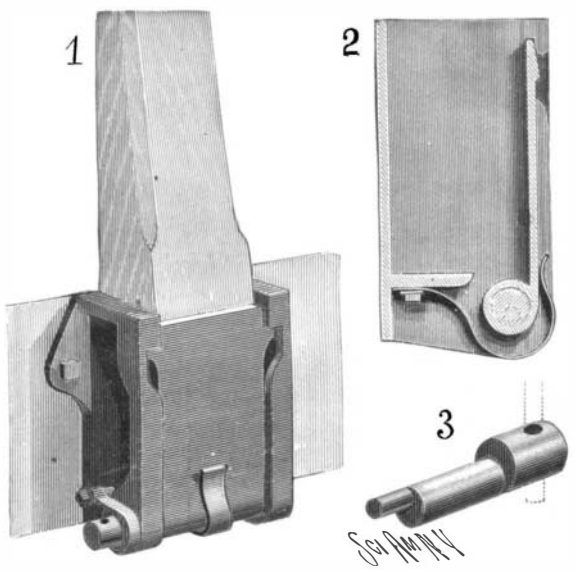
A HOLDER FOR CAR-PLATFORM STAKES.

An invention has been patented by Mr. James Cowan, of Holualoa, North Kona, Hawaii, which provides an improved stake-holder for railway-car platforms. Fig. 1 is a perspective view of the device; Fig. 2 is a sectional elevation; and Fig. 3 is a detail view of a peculiar operating shaft employed.

The holder comprises a casing having a back wall, side walls, a stop which serves to support the lower end



COWAN'S STAKE-HOLDER.

of a stake, and a swinging front plate. At its lower end this front plate is mounted on an eccentric shaft (shown in detail in Fig. 3) having bearings in the side walls. The shaft has an outward projection formed with an opening into which an operating lever may be thrust, as shown in dotted lines. Lateral projections on the upper end of the front plate are designed to pass through outwardly-opening slots in the front edges of the side plates and to engage in recesses at the upper portion of the slots. A spring is attached to the stop at one end, so that its free end is engaged against the outer surface of the swinging front plate (Figs. 1 and 2). By means of this spring the front plate is automatically swung into position. One of the side plates, as shown in Fig. 1, is provided with a stud to which is attached a spring coiled around and secured to the projected end of the eccentric shaft.

When it is desired to remove a stake, the eccentric shaft is rocked by means of the operating-lever previously referred to, causing the front plate to move downward and outward. The stake may then be removed. When the lever is released, the spring secured to the stop (Fig. 2) will force the front plate against the side walls, and the coiled spring will rotate the eccentric shaft and raise the plate into the recesses of the side walls.

Self-Registering Rain-Gage.

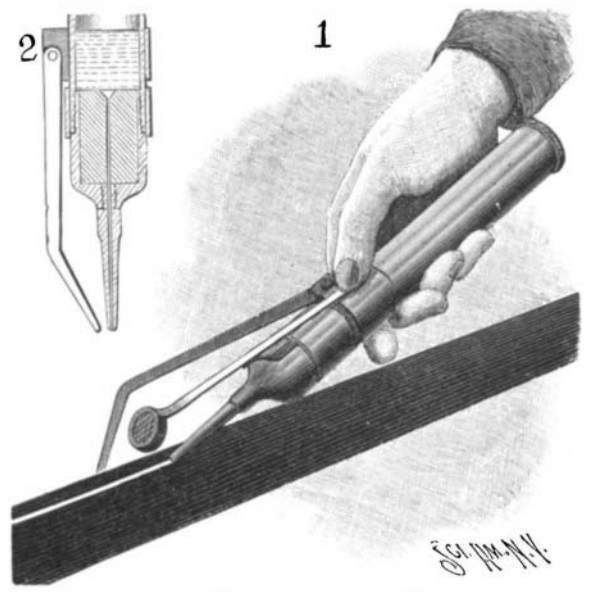
At the recent meeting of the British Association was described a new self-registering rain-gage, the invention of Mr. W. T. E. Binnie. The contrivance resembles the conventional type of rain-gage with the funnel for collecting the rain, but the neck of the funnel is smaller in diameter at the top than at the bottom. By this means the inventor contends he is able to let the rain pass from the receiving funnel into the receptacle below in drops of water of approximate size, owing to the laws of surface tension by which the formation of drops is governed. As each drop falls from the funnel into the vessel beneath, the impact of it makes and breaks the contact of a small electrical machine, which records each drop upon an automatic record, made to revolve upon a drum at a regular set speed.

A PAINT-STRIPER OF IMPROVED FORM.

Our illustration represents a simple device, by means of which painters can readily stripe flat or rounded surfaces. The device is the invention of Mr. George H. Allen, North Creek, N. Y.

The striper consists of a paint reservoir closed at one end by a screw-cap provided with a vent-hole controlled by an adjustable gate. At the other end of the reservoir a nozzle is located. Embracing the reservoir are two clips, the upper of which is made of spring metal and receives between its ends a guide arm bent near its lower end. The second clip serves the purpose of holding a flat spring, upon which a rocking arm is mounted, carrying at its lower end a sealing cup. The flat spring normally presses the sealing cup tightly against the nozzle to prevent the escape of paint from the reservoir.

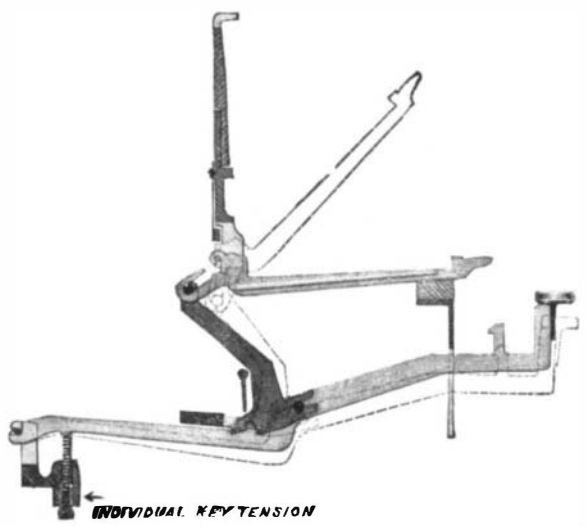
In order to stripe a surface with one or more straight lines, the guide arm carried by the upper clip is adjusted so that its bent end engages the edge of the surface. As the device is drawn along, the nozzle is opened by pressing the end of the rocking arm carried by the lower clip, so as to bring the sealing cup upward. The merits of the device are obvious.



AN IMPROVED PAINT-STRIPER.

THE UNDERWOOD TYPEWRITER.

It is rarely indeed that an American manufacturer contentedly folds his hands and admires his product with that smug complacency which implies that improvement is impossible. On the contrary, there are a thousand and one details to which he devotes the very closest attention and painstaking effort in order that his machine may issue from his factory, if not absolutely perfect, at least as perfect as he can make it. Ruthless competition and the demands of his customers will never permit him to rest. Nowhere in the field of modern industry is this constant improvement



TYPE-BAR MOVEMENT.

in detail more marked than in the manufacture of the typewriter, a machine so distinctly American that foreign makers have not as yet been able successfully to compete with the manufacturers of the United States. As an example of the infinite care and labor which has been lavished upon the writing-machine, we have selected a typewriter called the Underwood made by the Wagner Typewriter Company of 218 and 220 Broadway, Manhattan, New York city.

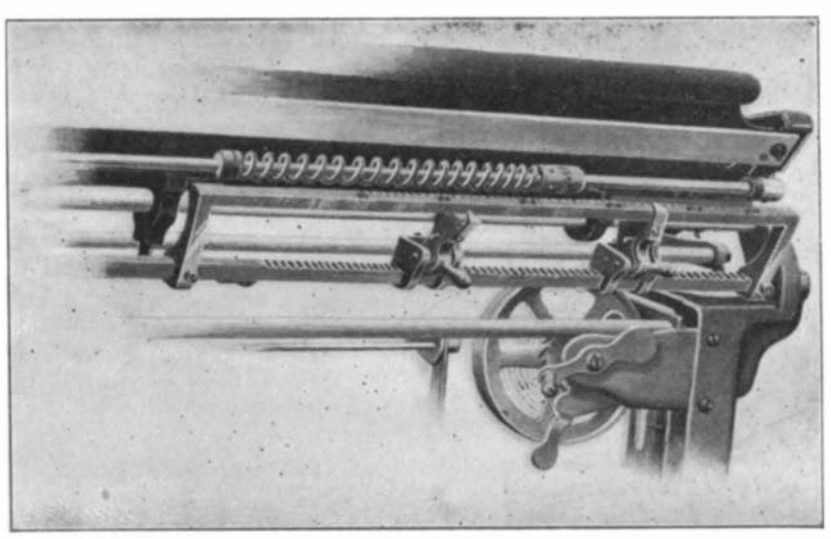
In general design and mode of operation the Underwood machine presents no radical difference from other typewriters. The features of novelty are to be found in an ingenious type-bar mechanism, which is one of the most successful attempts yet made to secure a perfectly even "touch;" in a simple tabulating device which adds much to the convenience of the machine; in a new system of line-spacing; and in an arrangement of platen and type-bars, which at all times enables the operator to see what has been written without lifting the carriage, and which, therefore, materially increases the speed.

In the type-bar mechanism, as may be seen by reference to our illustrations, the key-levers are fulcrumed at the rear of the machine, and are returned to their initial positions by coiled springs. Pins on the key-levers enter the slotted lower ends of bell-crank levers; while pins on the upper ends of the bell-crank levers engage the hooked inner ends of the type-bars. Upon depressing a key the corresponding type-bar is thrown with a constantly accelerating speed against the ribbon. The movement is somewhat similar to that of the hammers of an upright pianoforte, with the difference that the type-bar does not leap back after it has struck the ribbon. The merit of the invention is obvious. The type-bars act directly under the influence of the depressed keys, whereby a rapidity of movement is obtained which will satisfy even the most exacting operator. As in the ordinary form of machine, each key moves the universal bar. In the typewriter under consideration, however, the universal bar is moved only when the type-bar has nearly reached the printing point. Little resistance is, therefore, encountered. Instead of acting against the combined weight and resistance of the type-bar and universal bar, the operator here opposes the resistance and weight of the type-bar alone. Each key has its individual tension. The keys are, therefore, all depressed to the same extent and the same force. The small effort required to overcome the resistance and weight of the type-bar, the uniform key depression, and the individual key tension give to the "touch" a lightness, an evenness, and an elasticity which leave nothing to be desired.

The platen is not fixedly journaled in the carriage, but is independently shiftable by means of two shifting-keys. The one shifting-key is employed for making single capitals; the other for the continuous production of capitals. The two shifting-keys are connected by a rock-shaft. The key for the continuous production of capitals is provided with a pin which can be locked in place by a latch carried on the rock-shaft. The shifting-key is held in depressed position until the other shifting-key is tapped to throw the latch away from the pin.

The ribbon is carried on two horizontally-arranged spools and is made to pass about a guide, which, as a key is depressed, moves vertically on a fork, the forwardly-projecting divergent tines of which receive the type-bars. Perfect alignment is thereby secured. When the platen is shifted up or down, the ribbon-guide, together with the ribbon, is similarly shifted to

THE UNDERWOOD TYPEWRITER.



REAR VIEW OF MACHINE, SHOWING TABULATING SCALE.

keep the ribbon in proper position relatively to the platen or printing line. The arrangement is such that the work is at all times visible. The necessity of lifting the carriage from time to time to inspect the work not only is inconvenient, but so markedly lowers the speed that most manufacturers have found it advisable to provide some means for enabling the operator to see at least part of what has been written. It is one of the most meritorious features of the Underwood typewriter that the work is always entirely in sight.

The feed-dog comprises a fixed tooth and a movable tooth. The feed-rack is normally in engagement with the movable tooth. When a type-bar is launched against the platen, the fixed tooth is brought into engagement with the rack, so that during the printing movement of the type-bar, the rack with the carriage remains stationary, the movable tooth being at the same time free to snap back. On the return of the type-bar, the movable tooth again falls into the rack and enters the next notch. The movement is quick and positive.

The carriage is provided with an index which travels over a scale, and with a shoe which at a certain point of its travel depresses a shoulder connected by levers with a bell-hammer. The shoulder can be moved along the scale so that the written matter will end at the desired distance from the right-hand edge of the paper, and so that the bell will ring at the proper time. A movable stop is provided to limit the return movement of the carriage. Both shoulder and stop are provided with fingers which play along the scale, thereby enabling the operator the right and left travel of the carriage to any degree.

One of the most convenient adjuncts of the machine is a tabulating mechanism, which is both simple in construction and efficient in operation. The tabulating key-lever is connected with a spring-controlled rock-shaft mounted in the rear of the machine and formed with a rack which receives two or more stops co-acting with a scale and serving to arrest the carriage at the predetermined points of its travel. When the tabulating key is depressed, the feed-dog is thrown entirely out of engagement with the feed rack, so that the carriage is propelled by the force of the spring motor until arrested by the first stop. A second depression of the key allows the carriage to travel to the second stop, etc.; and a final depression to the end of its course.

The line-spacing devices consist of a ratchet wheel on the platen shaft, engaged by a pawl operated by a lever having horizontal movement. The horizontal spacing-lever is more easily manipulated than the usual vertical lever. One movement of the lever turns the platen and brings the carriage back to its initial position.

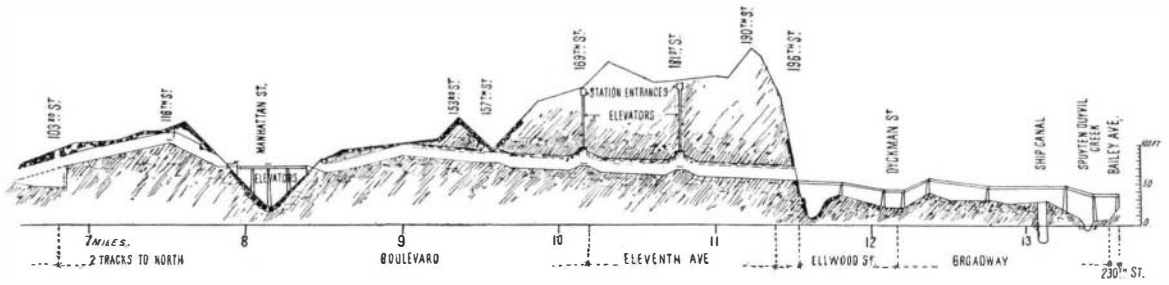
PROGRESS OF WORK ON THE RAPID TRANSIT TUNNEL, NEW YORK.

Work on the New York Rapid Transit Tunnel is now progressing at a rate which gives reason to hope that this great work may be completed within the contract time. We give several views, taken along the line of road, which show the plant and the methods of construction, which latter will vary considerably, according as the line is to be built as a subway or as a tunnel proper.

Just here it would be well to explain that strictly speaking the new road should be known as a subway and not by its popular designation of tunnel, and this for the reason that of the total 20 miles to be built, not more than about 3 miles will be laid in a tunnel proper, that is to say, in one which is excavated by driving horizontally through solid material at a depth of several feet below the surface. The term subway is applied to that portion of the road which will be built by making an open excavation, building within it the steel and concrete walls and roof of the subway, and then filling in around the structure and restoring the original surface of the road. Commencing from the downtown terminus, the first stretch of the tunnel encountered will be that which will extend beneath Park Avenue and 42d Street. The next section of any importance will be that reaching from 150th Street to Fort George; while on the eastward branch of the line there will be sections of tunnel where the road passes beneath the northwestern corner of Central Park, and beneath the Harlem River.

The subway is being constructed by what is known as the cut-and-cover method, as shown in one of our illustrations representing the progress of the work on Fourth Avenue below Union Square. A short length of cableway is erected on the western side of the street and with its assistance the excavation is carried down to the required depth, the material being shoveled into the cableway buckets, drawn up and loaded into carts which carry it to a convenient dumping place. As the subway is to occupy the full width of the street, it is necessary to cut away the whole of the underlying material below the tracks of the Metropolitan Street Railway Company, and this has to be done without interfering with the running of the cars. The structure of the underground trolley road is extremely heavy, and as the cars weigh from 8 to 10 or 12 tons apiece, the problem of supporting the structure while removing the material is a rather complicated one. It is met by placing two pairs of massive I-beams, 2 feet in depth and about 35 feet in length, parallel with the tracks and spanning the section to be excavated, and supporting beneath them a series of transverse 12 by 12 timbers, the timbers being secured to the longitudinal steel I-beams by bolts, each timber bearing against the base of the track yokes. With the track thus securely supported, it was possible to excavate beneath the structure without interfering with the traffic. After the excavation has been carried out down to sub-grade, the footings for the steel columns are laid, the columns erected, and the I-beams which form the framework of the walls and roof of the subway are laid in place. The temporary timber false work is then removed and the concrete arches are turned between the steel framing. Following this, four layers of felt and tar waterproofing are laid completely around the concrete, and an outer projecting sheath of concrete and brick is placed over the whole subway. The loose material is then filled in and the street restored to its original surface. Our illustration of the Fourth Avenue work shows the steel framing in place. This framing, by the way, is spaced about 5 feet apart and answers in some sense to the framing or ribs of a modern steamship. During the excavation, provision has to be made for supporting the water and gas mains and cable conduits, and this is done by slinging them by chains from 12 by 12 timbers which are temporarily supported on timber struts.

The particular piece of work to which we have just referred is, in respect of the difficulties of excavation, one of the easiest on the whole route of the subway, the material being loose, sandy soil, easily removable by pick and shovel. Over a great portion of the line, however, the excavation will be through solid rock, and blasting will be necessary. Drilling will be carried out almost exclusively by pneumatic drills, and to provide the power for operating these, two out of several power stations have already been erected, one in Union Square, and the other at 165th Street and the Hudson River. The compressed air is led from the station by 8 and 10-inch mains of steel pipe, the mains being laid parallel to the route of the tunnel throughout the sections which they are intended to serve. The air is led from the mains to the drills by flexible piping. Our illustration shows the 165th Street plant, which at present consists of four 125-horsepower locomotive boilers, and two Rand compressors, with steam cylinders 36 inches and air cylinders 24 inches in diameter, by 2 feet 6 inches stroke. At present the air is delivered at 90 pounds pressure, but ultimately when two more compressors are added, and work is being carried out on a more extensive scale, the pressure is to be increased.



PROFILE OF THE RAPID TRANSIT TUNNEL FROM 103d STREET TO BAILEY AVENUE.

Although not much of the rapid transit road will lie in tunnel proper, where it does pass beneath the surface it will, in places, lie at a very considerable depth, particularly beneath Washington Heights. In the stretch of about 2¼ miles, from 150th Street to 195th Street, the road will be at an average depth of about 120 feet below the surface of Broadway, and in that distance there will be two subterranean stations, one at 169th Street, one hundred feet below the street, and another at 181st Street at a depth of 120 feet. The latter station and the elevators and tunnels by which it will be reached are shown in section in one of our front-page engravings. The vertical excavation for the shaft will contain two large elevators and a stairway, the stairway being provided in case of a breakdown at any time in the elevator service. The station will consist of a large chamber excavated in the solid rock, the roof being in the form of an elliptical arch. There will be two elevator landings at the bottom of the shaft, the upper one of which will discharge its passengers at the level of a bridge, which will extend across the tracks and enable the passengers to reach the downtown tracks. During the morning hours the elevators will stop at this level, for the reason that almost all of the travel at that time will be in the downtown direction. During the evening hours, when business men are returning from the city, the elevators will run to the lower level, so as to save passengers the necessity for climbing any stairways. The elevator cars will be unusually large, with sufficient capacity to remove all the passengers unloaded from one train before the next train enters the station. The excavation for the 169th Street station is so far advanced that the vertical shaft and the transverse tunnel leading from the shaft to beneath Broadway are completed, and about 25 feet of drifting has already been completed north and south beneath Broadway on the line of the tunnel itself.

One of the most interesting portions of the work, just now, is the excavation between 156th Street and 158th Street. By reference to the accompanying profile of the line, it will be noticed that this stretch of line is located at the bottom of the depression between 153d Street and 163d Street, where the tunnel approaches very nearly to the surface of the ground. For a distance of about 600 feet the material will be taken out in open excavation, as shown in our photographs, the steel caging of the subway being built in place and the road restored to its original surface in the manner already described. Drifting is being carried actively forward at 158th Street, and we present two views of the drift, one looking north, and the other looking south from the interior of the tunnel. Excellent progress is being made on this section of line, and it is likely that it will be one of the first portions to be completed. Our thanks are due to William Barclay Parsons, the chief engineer, and George S. Rice, the principal assistant engineer, of the Rapid Transit Tunnel, for courtesies extended in the preparation of this article.

Experiments in Long-range Rifle Fire.

That the modern magazine rifles are capable of carrying long distances has been borne out by the Boers having been able to inflict considerable damage upon the English at a range hitherto deemed impossible, and this fact has been specially emphasized in those cases where they have had an opportunity of previously ascertaining the correct range. In the British army the soldier has never been drilled in rifle fire at a greater range than 1,000 yards. To exactly ascertain the efficacy of rifle fire at a long range, Sir William Butler, formerly commander-in-chief of the South African forces, has been carrying out some interesting experiments at the Aldershot camp. A body of infantry were supposed to be marching in columns over an open space, the range of which was known to another force holding an intrenched position a considerable distance away.

The advancing columns were represented by eighteen large canvas screens, each measuring 90 feet in length and 6 feet in height, and separated from one another by a distance of 25 paces, so that from the front rank to the rear rank occupied about 1,200 yards. The screens were painted light brown in color, and closely resembled the shade of the sandy soil upon which they were placed. The intrenched position was held by a selection of marksmen at a range of 2,000 yards. Each soldier was supplied with fifty rounds of ammunition. At this range the soldiers could not descry the canvas screens without the aid of field glasses, and then only the front screens were visible, those in the rear being hidden by the configuration of the ground. Near the screens the marker's hut had been erected, and the officer in charge was connected with the intrenched position by telephone. Fire was first directed upon the targets from a range of 1,900 yards, and finally increased to 2,200 yards. At first the shots were fired singly and the effects of each notified, the results being very satisfactory. Then volley firing was practised with equal success. In all 2,000 shots were discharged, 15 per cent of which were reported as hits. The front screen was completely riddled. Of course, numerous shots fell between the screens, and although they were not considered in this test, they would have yet been useful, since they would probably have hit the feet of enemy. The experiments proved the high carrying capacity and efficiency of the Lee-Enfield rifle and the accuracy of its sighting.

A New Barometer.

At the recent meeting of the British Association, A. S. Davis, of Leeds, showed a most interesting barometer. A glass tube ten inches long and an inch in diameter ends in a bulb below and reaches above into a mercury basin. The mercury flows down the tube, compressing the air. When not in use, the barometer with its stand is kept upside down. It is inverted for use, and a reading quickly taken when the column has come to a standstill. When the ordinary barometer rises, this one falls. The tube is water-jacketed, and a calcium chloride tube is inserted to dry the small quantity of air sucked in. The readings are said to be very accurate, though the range of each instrument is small.