durum wheat proposition has been pushed in the Northwest for about three years. The large millers have fought it, but others have been convinced that if this wheat would grow in the so-called semi-arid sections the productivity of the Northwest would be increased, and the chances for new wealth would be larger every year and land values rendered more stable.

As a matter of fact, the macaroni wheat controversy has been a feature of the grain trade. Secretary Wilson and Mr. Carlton, of the Department of Agriculture, have encouraged the farmers to grow it, and gradually it is being more generally introduced, so that farmers who are seeding it have made money. The acreage each year is larger than the year before, and prices increase. This wheat contains more gluten than that ordinarily used for flour.

Another subject that is claiming the attention of Western railroads is that of good dirt roads. If the farmer has difficulty in hauling his grain to the cars, the roads may well be interested and try to rectify matters. A year ago the editor of a large farm magazine suggested to some of the principal roads that they run "Good Road Trains" similar to the "Good Seed Trains," and engage a man to lecture on good roads. The result was that trains of this description were run through Iowa and neighboring States for a month. Meetings were held in many cities, and prizes were offered to farmers who could make the best road with a split-log drag.

The success of this "Good Roads Car" has been so gratifying, that one road has issued complete directions how to make and use these split-log drags, which are simply an arrangement of two logs seven to nine feet long and ten to twelve inches in diameter. These are set on edge thirty inches apart, and fastened with three strong pins wedged firmly in. A chain runs through the center of the front log at the right end and over the left end of the same log. This is hitched to the horses, and the driver stands on a movable platform placed on the logs. The whole thing is remarkably simple, and is taken off the train at stations where roads are particularly bad and a demonstration is made. Telephone poles are remarkably good to make these drags, and they are so cheap that every farmer can make one at a minimum outlay of time and expense.

Few realize the interdependence of business and railroads. Country towns exist to supply the needs of the farmer, and their prosperity is gaged by the crops of the latter. There is little profit to the merchant, the miller, the lumberman, the bank, if the farmer's crops fail or if he has to combat with poor roads to get his produce to the shipping point. Railroads realize that traffic along their lines, both passenger and freight, depends on the prosperity of the farmer. When the crops are good, cars and crews are in demand, and the wide-awake roads which are preaching the "Good Seed Gospel" and "Good Roads Movement" are profiting in more ways than one. All through the Mississippi Valley the farmers in the corn and grain countries are eagerly availing themselves of these opportunities to improve the character of the land, and the chances are that the educational trains already in vogue will be supplemented by others as occasion demands.

Fig. 2.—Part of the First Section Passing Through the Forest.

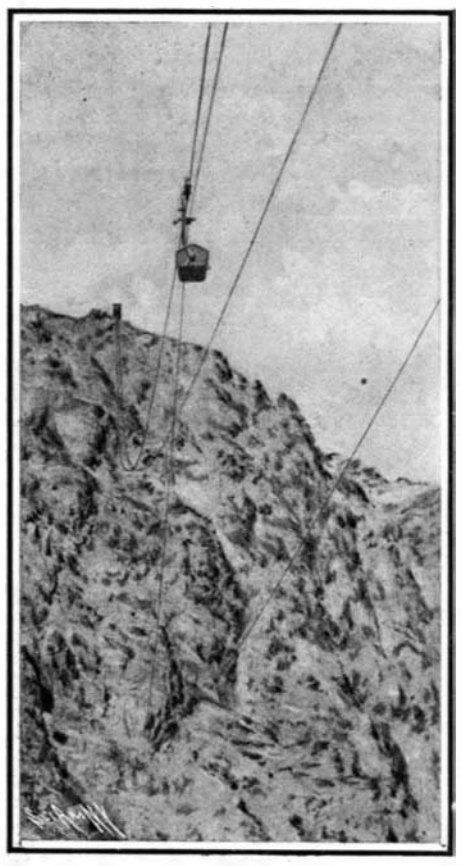

Fig. 3.—View of the Second Span, Showing the Double Support in the Distance.

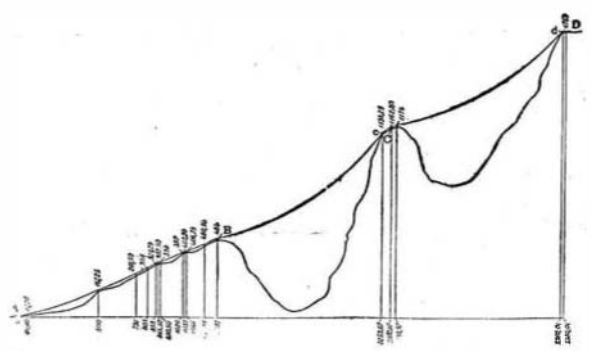

Fig. 1.—The Path of the Rope Tramway.

A WIRE ROPE RAILWAY USED IN THE CONSTRUCTION OF AN ITALIAN FORTRESS.

BY DR. ALFRED GRADENWITZ.

The ropeway described in this article was constructed by Messrs. Ceretti & Tanfani, of Milan, Italy, for use in the construction of a fortress. It is remarkable for its enormous spans and for the extraordinary altitude it reaches. The plant belongs to the Cesana Community, in the Cottian Alps, and passes between Briançon and Oulx at the foot of Mont Genèvre. The construction of this ropeway, which at present serves for the transport of all sorts of building materials required in the construction of one of the largest Italian Alpine fortresses, was supervised by the Italian engineering corps. When the fortress is completed the plant will be used for the transport of gun parts, ammunition, and rations for the garrison. Designed on the three-rope continual-operation system, the ropeway is provided with two separate runways, one of which serves for the incoming filled cars and the other for the return of the empty cars, while the third, used as a hauling rope, is situated beneath the two runways and operates the railway.

The runways are constituted by two carrying ropes, located at the same height, 7.7 feet distance from each other, and anchored in each of the stations. The runways are held taut by freely suspended weights which are connected to the carrying ropes by means of flexible ropes running over rollers. The uniform tension thus produced avoids the possibility of an overload and results in a safe compensation of any difference in tension, due to changes in temperature. The total length of the ropeway, which comprises three sections, is about 25 miles, the difference in level being 5,984 feet. Two intermediary tightening stations are provided for tension devices and anchorages for the carrying ropes.

The lowermost section starts at Cesana Station at 4,510 feet above the sea level (see *A*, Fig. 1) and leads as far as the first intermediary tension device (*B*, Fig. 1) at 6,097 feet altitude. Between these two sta-

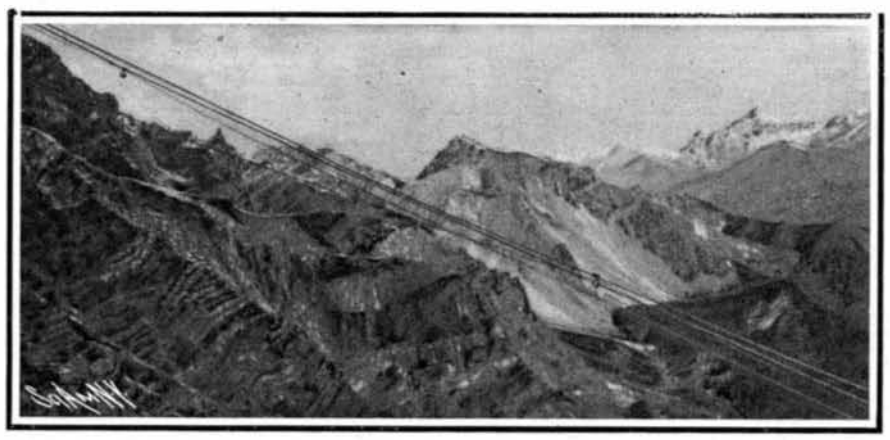

Fig. 4.—Part of the Second Span.

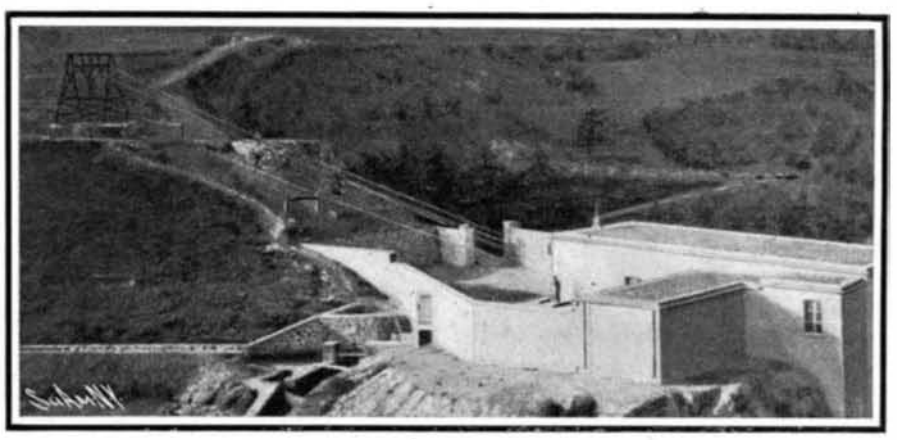

Fig. 6.—The Driving and Loading Station.

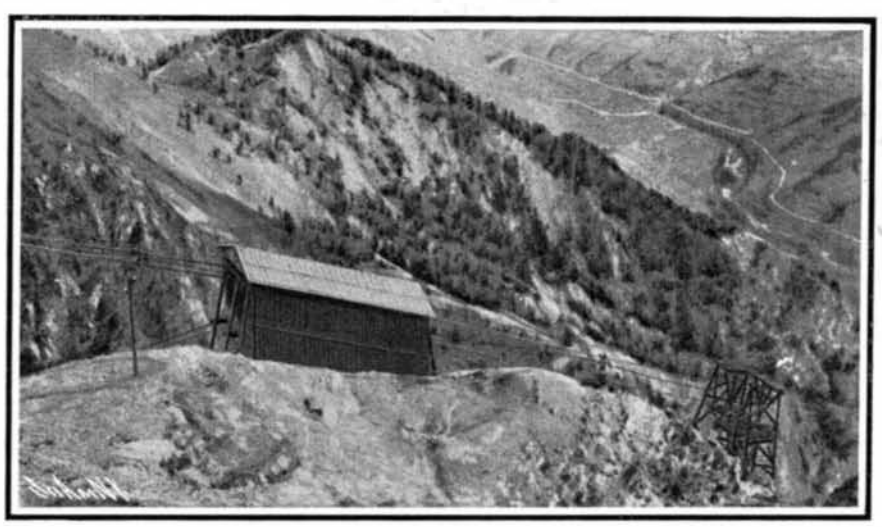

Fig. 5.—The Second Intermediary Tension Device and the Double Support in Front of It.

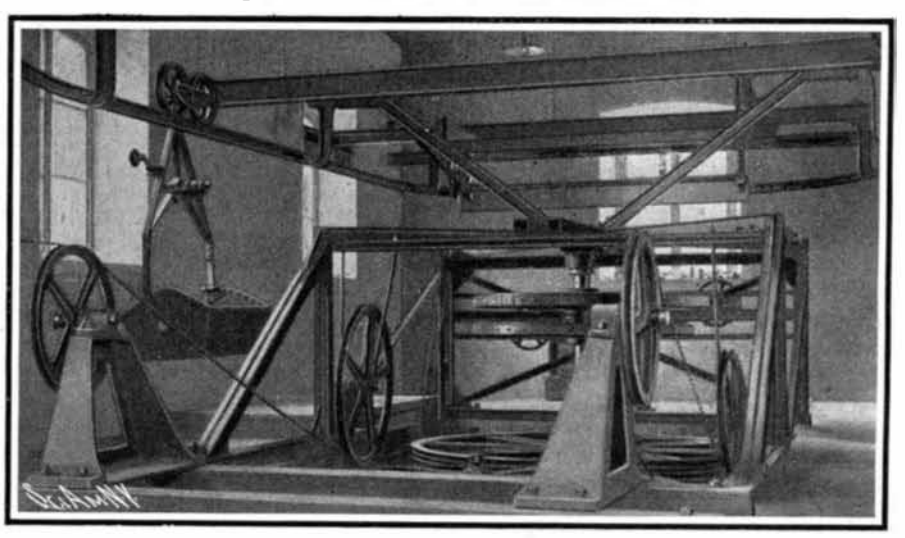

Fig. 7.—The Driving Gear.

tions there are eleven wooden piers with a maximum distance of 1,312 feet.

In Fig. 2 is shown part of the first section, the ropeway traversing the thick woods. A spirally wound rope, one inch in diameter, made from first-class case-hardened steel wire and having 95 tons breaking strength per square inch, supports the loaded buckets, while a similar rope of the same quality and of ¾ inch diameter has been provided for the emptied buckets. Both of these ropes are anchored at the first intermediary station with their tension weights in the lower motor station. In order to avoid any sliding of the traction rope in the 1,312-foot span (Fig. 1), wooden supports have been provided, carrying cast-iron guiding rollers. From the first intermediary tension device, *B*, the ropes are carried as far as the second tension device by a single double support, *c*, situated not far from the second station, *C*, so as to obtain a span of 4,100-foot length with 2,296 feet level difference. On this span of the railway two different views are represented in Figs. 2 and 3. The second intermediary tension device, *C*, with the double support, *c*, located in front of it, is shown in Fig. 5. The supporting ropes of this section are 1.12 inches and 0.8 inch in diameter.

Another large span of 7,380 feet length, overcoming another 1,968-foot level difference, will be found on the third section, where supports, *d*, have likewise been arranged shortly before the two stations, *D*, to insure the same satisfactory guiding of the rope. The supporting ropes are 1.12 inches and 1 inch in diameter respectively, and are anchored at the unloading station situated at 10,496 feet above the level of the sea, whereas the tension weights are arranged in the second intermediary station. As the various lengths of rope vary between 1,205.6 and 1,476 feet, their ends have been provided with couplings, which are filled with cast metal and which have a far higher breaking point than the rope itself, thus avoiding a loosening of the couplings.

The unloading station at Chaberton (*D* in Fig. 1), which is situated at 10,496 feet above the level of the sea and therefore covered with snow during the greater part of the year, is a structure built almost entirely of wood. The carrying ropes of the third section are anchored by means of railway rails in the foundations, and are thus perfectly isolated from the wooden discharging structure. The transition from the ropes to the station is effected by means of a steel tongue, to which are connected the suspended railway rails of the station, serving to transfer the arriving unloaded trucks to the empty rope. For the suspension of these rails there have been arranged so-called suspension shoes, which are fixed to the wooden structure at 6 to 10 feet distance. On entering the station the truck is automatically unlatched from the continually moving hauling rope and after being unloaded by the operator is conveyed to the other end of the rail, there again to be automatically coupled to the hauling rope.

The two intermediary tension devices serve for carrying the tightened and moored ropes by means of suspension rails, effecting by the aid of tongues a connection between the rope and rail. These rails have the same gage as the two carrying ropes, so that the trucks are allowed to pass over the rails without being loosened from the hauling rope, thus doing away with the necessity of any superintendence in such stations.

The tension weights above referred to, which tighten the ropes of the second and third sections, are loaded to one-fifth of the aggregate breaking strength of the rope, warranting in the latter a five-fold safety against breaking.

The driving and loading station (Fig. 6) is designed entirely of cement masonry, being connected with the 80-horse-power turbine plant which serves for the operation of both the wire-rope railway and the electric lighting dynamo. The trucks are here also automatically disengaged from the hauling rope and again coupled to it. The station is provided with a suspended railway serving for the passage and loading of the empty trucks.

The driving gear, as seen from Fig. 7 (showing an internal view of the station), comprises a main driving sheave with two leather-lined grooves, several intermediary sheaves and the sledge sheave of 6.56 feet diameter. The drive is transmitted from the turbine shaft by means of a belt disk and conical wheel gearing to the vertical shaft, to which the main rope disks are fixed. For stopping the ropeway there have been provided two wood-lined brakes.

The ropeway is engaged and disengaged by means of a clutch mounted on a turbine shaft. Beneath the floor has been arranged the sledge for the hauling rope which, owing to its length, has been designed as three-groove tackle with disks of 6.56 feet diameter. The traction rope, which is made from the best, highly flexible, case-hardened steel wire of 120 tons breaking strength per square inch, is ¾ inch in diameter and is stretched to one-tenth of this breaking strength. The speed of the hauling rope varies between 5 and 7 feet per second, the distance of the trucks being about 1,575 feet. As the latter arrive at intervals of 240 seconds, the output of the plant will be 13,000 pounds per hour, the capacity of each truck being 880 pounds. The motive force yielded by the turbine is about 55 horse-power, only eight men being required to operate the arriving and starting trucks.

The mean gradient of the railway is 50 per cent, while gradients of up to 100 per cent or 1 in 1 as occurring in some parts, are dealt with with the same safety.

The Failure of Santos Dumont's New Aeroplane.

Santos Dumont tested his new aeroplane on the parade grounds at St. Cyr on March 27, with the result that this latest and most fragile flying machine was smashed beyond repair, and was afterward cut to pieces with a saw. Two runs were made across the field. In the first one, a speed of but 12 miles an hour was obtained. In the second, the speed was perceptibly greater, but after the machine had covered half the length of the field it struck a rough spot and broke in two. The accident was apparently the result of insufficient bracing of the planes. These, as can be seen from a glance at the photographs in our last issue, were set at a wide dihedral angle without any bracing whatever. M. Dumont signified his intention of building a third aeroplane soon, and of using better material in it. In the meantime he expects to experiment further with his old machine, "14 bis," with which, it will be remembered, he flew successfully last autumn.

In a paper on the "Installation of Centrifugal Pumps," by Mr. W. O. Webber, the author states that it is safe to say that 65 per cent represents the average commercial efficiency of the multiple-stage turbine pump in the market to-day, while 80 per cent can be realized upon the straight, single-impeller, volute, centrifugal pump at heads of less than 100 feet.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

TELEPHONE-RECEIVER.—L. STEINBERGER, New York, N. Y. The several objects of the invention are to provide the receiver with a casing of metal; to provide telephone receivers or similar devices in which the magnet and other parts—such as binding-posts, binding-post sockets, and the suspending-hook—are imbedded in an insulating material which forms a core that is received in an outer case, and finally to intensify the sound-waves reproduced by the receiver.

ALTERNATING-CURRENT PLANT COMBINED WITH STORAGE BATTERY. — L. SCHRÖDER and A. MÜLLER, 31A Luisenstrasse, Berlin, Germany. The invention relates to alternating-current plants combined with storage batteries, and has the purpose to regulate the charging and discharging of the storage battery in such a manner that if the current used in the plant varies the prime mover actuating the main generator continues working with constant load. The application is for a division of the pending application formerly filed by these inventors.

ELECTRIC SIGNAL SYSTEM. — E. CHOUTEAU, JR., St. Louis, Mo. The invention relates to electric railway-signals, the more particular object being to produce a system which is to a certain extent automatic and to a certain extent is controlled at will. By means of the arrangement the engineer's mind is kept constantly trained, so that vigilance becomes habitual and there is no relapsing into the habit of carelessness.

Of Interest to Farmers.

CORN AND BRUSH KNIFE.—D. B. DATE and A. B. KUGELMANN, New York, N. Y. One of the purposes of this improvement is to provide a construction of corn and brush knife whereby labor will be much reduced and which will cut simultaneously and equally at both sides of the slanting stalks and brush, producing a clean shear cut having an upward inclination.

CULTIVATOR. — A. M. BARKER, Franklin, Neb. This invention relates to straddle-row cultivators, and has for its object the provision of means effective in operation, and durable in use adapted to cultivate one or more rows of plants, as may be desired. Means are provided enabling the gang-beams to be adjusted at the desired distance apart.

Of General Interest.

WINDOW-SHADE ADJUSTER.—NELLIE F. CAPPS, Red Bluff, Cal. This invention introduces a new feature in shade adjusters, enabling the operator to raise or lower the shade, admitting air and light as desirable in offices, or to bring out the shade transversely from the window casing, to swing it to right or left to admit air and shut out rays of light, as is especially desirable in sleeping rooms in hot weather. It is very simple, requires no fitting, is easy to put up, does what is claimed for it, and can be cheaply manufactured.

DIVISION-PLATE FOR EGG-CASES.—C. J. VOORHORST, Chicago, Ill. The invention is an improvement in pocketed packing-plates for use in holding eggs, fruit, or other articles during transportation or storage. The plates when made of paper-pulp or similar material will be comparatively rigid as to their egg-receiving units or pockets and somewhat flexible as to the lines along the curve-reversing line, so it will possess the strength of the dome or arch in the pockets to protect the eggs and also the desired flexibility to permit its adjustment or yielding when in use.

PAINT.—J. F. VILLARD, Rexton, New Brunswick, Canada. In this composition of matter adapted for use as a paint the ingredients are so united that they will remain homogeneous and in it the oil will not separate from the other ingredients even when the paint is left standing in the cans. This paint will not prematurely run and drop from the brush.

TRUCK FOR WOOD-PRESERVING RETORTS.—H. M. ROLLINS and A. J. NEFF, Houston, Texas. The principal object of the invention is to so construct a truck as to permit the loading of a greater amount of wood upon it than has heretofore been the case, and especially to provide for filling practically the entire space with a retort with wood or other articles to be treated. A further object is to provide for preventing the lifting of the truck when the liquid preservative is introduced into the retort.

CASK OR VESSEL FROM WHICH LIQUID IS DISCHARGED UNDER PRESSURE.—G. LINDNER, 88 Kriegstrasse, Karlsruhe, Baden, Germany. The object of the invention is to cause the vessel to operate with expansion of compressed air in order to fully utilize the energy of the compressed air, to effect economy in driving power. For this purpose two floats are employed. This air enters the vessel with a higher pressure than is necessary. In consequence the air-pressure at the commencement accelerates the motion of the liquid and maintains rapid current. The vessel emptied to a certain extent, one float closes the air-supply. Compressed air now operates in further expelling the liquid until pressure has sunk correspondingly to pressure of the liquid-column. This attained, the second float opens the air-discharge.

PIANO SOUNDING-BOARD. — THEODORE WOLFRAM, Columbus, Ohio. Mr. Wolfram's sounding-board is formed with a continuous rib spaced a uniform distance from the inner contour of the back frame. The usual transverse ribs are secured to the face of the sounding-board within the continuous rib. By this arrangement that portion of the sounding-board lying outside of the continuous rib is wholly unobstructed, so that the sounding-board is rendered exceedingly sensitive to vibrations. Every part of the sounding-board is in sympathy and weak places in the scale are prevented. In general, the tone is richer, and a very superior sustaining quality is obtained.

Hardware.

CULINARY TONGS.—C. F. SMITH, New York, N. Y. The tongs are for use in grasping and lifting such articles as eggs, potatoes, and the like. They are composed of a single wire bent upon itself at its center to form arms, connected together by an eye, which serves as a spring tending to hold the arms in separated relation. At the end of each arm a pocket is provided of like construction, these pockets being formed by spirally coiling the wire conically and in an oval shape, thus adapting the pockets for grasping and lifting the above-named articles.

Machines and Mechanical Devices.

PAPER-MAKING MACHINE.—J. B. WALKER and A. R. BOND, New York, N. Y. The invention relates to paper-making machines, particularly of the type known to the art as "cylinder-machines." The fibers of paper ordinarily made have a general trend or grain in the direction of the length of the paper, mainly due to the fact that the fibers deposited on the screen are dragged through the pulp in the tank as the cylinder revolves and are virtually combed in the direction of rotation. By means of the invention, a paper is produced with a grain running transversely to the length of the paper.

MACHINE FOR CUTTING WEB MATERIALS.—W. D. SKIDMORE, Pelham, N. Y. A carriage reciprocates along the line of movement of paper or other stock and is actuated by a cam device to move with and in direction of the stock during cutting operation. Stock cutting is effected by ledger and shear blades mounted on the carriage, the latter blade being periodically advanced to cut by a tappet mechanism geared to work in time with the movements of the stock and carriage. From the knives the cut stock is received by a set of delivery-rolls which deliver from the machine. These rolls may also be made to crease edges of cut material so that each length will preserve its direction until clear of the machine, to make room for the succeeding length.

PISTOL.—M. J. SHIMER, Freemansburg, Pa. The frame mechanism consists of but two main elements, the trigger and hammer and accompanying springs. The trigger automatically follows the hammer to cocked position and acts as a sear to hold it cocked until the trigger is pulled. The principal purpose of the inventor is to provide means whereby when the barrel is broken or opened to introduce a cartridge the hammer will be automatically locked in full cocked position and the trigger will be held stationary until the barrel is restored to normal position.

SAW-SHARPENING MACHINE. — J. D. MCAULAY, Baddeck, Nova Scotia, Canada. The machine comprises means for carrying the saw and actuating devices for moving the saw to bring the teeth thereof successively into proper position to be sharpened. Reciprocating sharpening devices are used, together with a guide therefor, in association with a horizontally-shiftable supporting-frame for said guide, the organization being such that the sharpening devices proper may be quickly shifted and set to different positions relatively to the stand for enabling the sharpening to be effected.

FILLING-FINGER.—W. E. LYFORD, Thompsonville, Conn. The invention pertains to yarn-printing machines, such as are used by carpet manufacturers in making tapestry and other carpets, rugs, and the like. The object is to provide a finger for guiding yarn onto the printing-drum, and arranged to smooth the yarn on the drum, thereby insuring a proper uniform application of the color onto the yarn during the subsequent usual process of printing.

AIR-COMPRESSOR.—A. GOOD, Claflin, Kan. The invention has reference to cylinders and valve mechanism suitable for use as an air compressor or as an engine. In operation the device may be used for withdrawing an aeriform body through a pipe leading to any desired point—say to the bottom of a mine and expelling the body through a hand-valve. The device is used in this way for the purpose of removing choke-damp and noxious gases from mines and causing the latter to be filled with fresh and pure air.

ADDING-MACHINE.—A. I. GANCHER, New York, N. Y., and A. T. ZABRISKIE, Passaic, N. J. The object of the present invention is to provide a machine arranged to render the action of the number-wheels positive and without danger of the parts easily getting out of order and to allow convenient and quick resetting of the machine to zero when desired. It relates to adding-machines, such as shown and described in Letters Patent of the United States formerly granted to N. H. Kodama and A. I. Gancher.

BOOKBINDING-MACHINE.—W. E. BLAUVELT, New York, N. Y. The invention relates to improvements in machines for affixing the crash, the head-bands and the paper lining to books preparatory to placing the covers thereon, an object being to provide a machine of this character by means of which the work