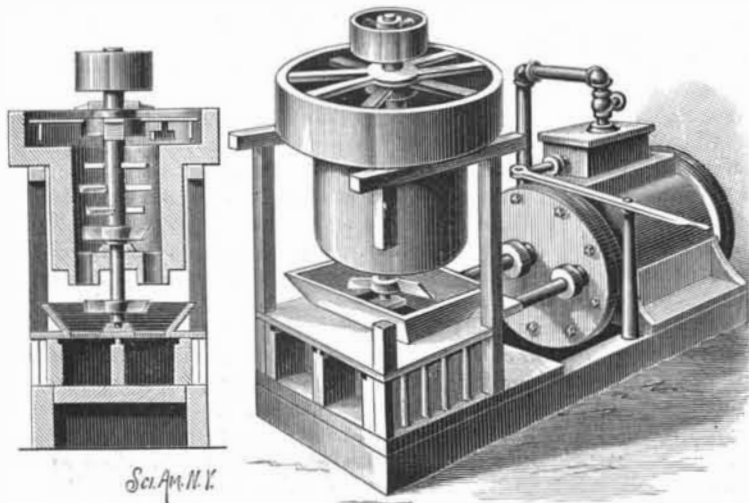


**New Observatory.**

Denver is about to have an astronomical observatory that will rival the famous Lick Observatory in California. Its dome will rise from a plain and have 1,000 feet greater elevation. The building and instrument have been provided for through the liberality of W. B. Chamberlain, of Denver. The framework of the metal dome is of iron and steel, and is made as light as is consistent with a high degree of rigidity. The covering is of galvanized iron. The weight of the dome will be about twelve tons, and the devices for making it revolve easily are very ingenious; the endeavor is to substitute rolling for sliding friction. For this purpose a live ring is employed. This consists of a number of wheels set at equal distances around a circular track; on the circumferences of these the dome rolls. The telescope, which is now being completed, will be a very valuable and expensive instrument. The diameter of the object glass will be 20 in. and the length of the tube about 26 ft., of the best hard rolled steel.

**AN IMPROVED PUG MILL.**

A mill designed to thoroughly and economically mix and grind clay, and force the tempered clay into the mould box of a brick machine, is illustrated herewith, and has been patented by Mr. Henry Woodcock, of Perth Amboy, N. J. On the base of the machine is mounted a steam cylinder, together with a frame supporting the receptacle in which the clay is worked and tempered. This receptacle has a circular pan at the top, below which is a cylindrical mill, in the bottom of which are two passages through which the clay



WOODCOCK'S PUG MILL.

drops into a hopper below, in the center of which a vertical shaft is stepped. A spider frame is carried by the shaft in the circular pan at the top, the arms of the frame having blades and a scraper, to work the clay and force it into the mill below. In this mill the shaft carries arms for agitating and working the clay, and a propeller for forcing it through to the hopper, as shown in the sectional view. In the hopper the clay is further worked, and forced through passages in the bottom to boxes below, there being in each box a follower, both of them connected to the same piston head in the steam cylinder by piston rods, so that both are operated at the same time by a single steam cylinder. Each follower is provided with a plate at its upper edge to close the openings at the bottom of the hopper, when the followers are thrust forward to force the tempered clay out of the machine.

**New York as a Milling Center.**

There is a steadily growing impression that New York City is destined to be one of the chief milling centers of the country ere long. There are many cogent reasons for this belief. Being the leading seaport and moneyed center of the country, with a large storage capacity, and also the natural terminus of the principal railways, as well as the Erie Canal, the available supply of wheat is generally likely to be abundant. Furthermore, as it draws its supplies from all quarters of the country, the assortment is, of course, apt to be better than ordinarily obtainable at interior points. This will assuredly give the miller a decided advantage. Loud complaint has been heard recently from the West, but particularly from winter wheat States, regarding the difficulty of obtaining supplies of wheat at prices on a parity with those current in New York. These facts have induced several gentlemen of means and experience to erect a first class mill here. Among the leaders in this enterprise are Messrs. B. B. Stewart, a well known citizen of Cincinnati, J. C. Ott, of the Produce Exchange, and William Sumner. The mill, which will be chiefly brick, and six stories high, with a daily capacity of 1,500 barrels, is now being constructed under the personal supervision of Mr. William D. Gray, the well known expert of the firm of E. P. Allis & Co., of Milwaukee. No pains or money will be spared to make this mill perfect in every respect. The location is an excellent one, being at Mariner's Harbor, on the Kill Von Kull,

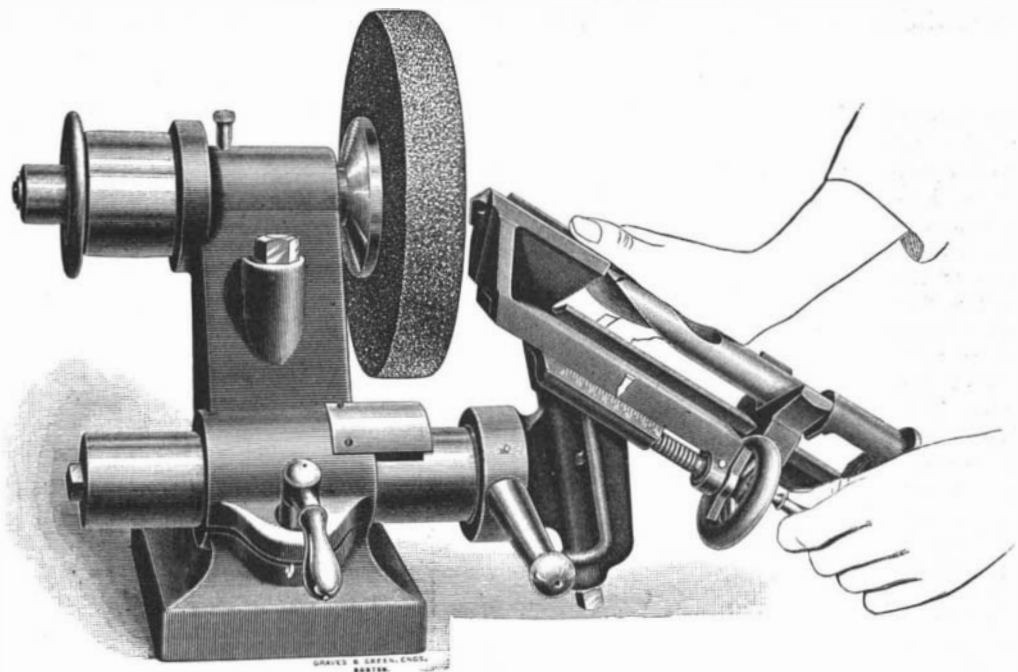
Staten Island. The property is 987 feet deep, 300 feet wide in the rear, and 265 feet front on the water. The dock will have 20 feet of water at high tide and 14 feet at low tide. Moreover, the Baltimore & Ohio Railroad will run tracks down the entire length of the property. This will give first-class railway as well as water facilities. Hence wheat can be delivered direct from cars or boats into the mill, and the flour out in the same way.—*Produce Exchange Reporter.*

**Purification of Mercury.**

The following process for the purification of mercury has been in use for some years at the Physical Institute at Kiel with the best results. The mercury containing chemical and mechanical impurities is poured into a glass tube, into the lower end of which is cemented a piece of bamboo cane which acts as a filter. The mercury passes through this into a larger glass tube almost entirely filled with dilute nitric acid (1 in 50), and on leaving this bath is sufficiently pure for some purposes. The distilling apparatus to prepare chemically pure mercury consists of a glass tube about 15 mm. wide and 80 cm. long, at top of which is a bulb of about 6 cm. diameter. The open end of this tube is placed in an inverted bottle with the bottom knocked out. Through the cork in the neck of this bottle is passed a second tube about 1 cm. wide and 145 cm. long, which passes through the other wider tube and up into the bulb at the top of it. This narrower tube is also contracted into a capillary one about 40 cm. from the top, and at the lower end is bent upward. To work the apparatus, the wide tube and bulb are filled with mercury and inverted, which creates a vacuum in the bulb, and more mercury is poured gradually, drop by drop, into the narrow tube to increase it, and the apparatus then acts like a Sprengel pump. The bulb is then heated by the flame from a circular burner, and distillation takes place continuously, the absolutely pure mercury flowing out at the bent-up end of the smaller tube. Unless the atmospheric pressure varies greatly, the apparatus can be left at work night and day, and only requires the addition of mercury two or three times in 24 hours.

**AN IMPROVED DRILL GRINDER.**

A drill grinding machine which can be sold at a moderate price, and which will hold twist drills varying in size from  $\frac{1}{4}$  inch to 2 inches, is illustrated herewith, and has recently been perfected at the Washburn shops of the Worcester Polytechnic Institute, Worcester, Mass. The wheel spindle has a conical bearing, adjustable for wear, while the emery wheel is of cup form, the drill being applied so that its perfect grinding does not depend upon a perfect wheel surface, a new place on the wheel being used each time a drill is ground. The workman places the drill in the V-shaped holder, sets the pointer on the scale to a figure corresponding to the diameter of the drill, and with the thumb of the right hand places the drill with its lower cutting lip against a projecting gauge which secures its correct position. The drill holder is then pushed forward till the drill nearly touches the wheel, where it



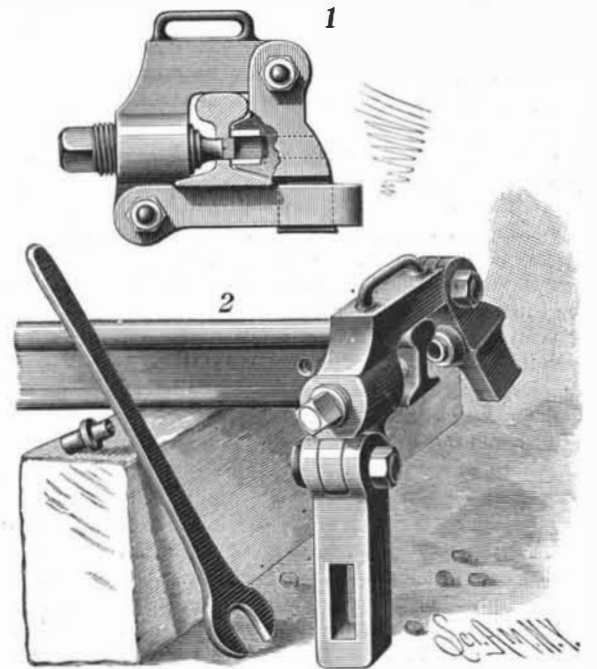
A TWIST DRILL GRINDER FOR GRINDING DRILLS FROM ONE-QUARTER INCH TO TWO INCHES DIAMETER.

is clamped by the handle at the left. Then the grinding is done with the two hands, the correct form of the cutting lip being made by rocking the holder and drill about a vertical axis at the same time that it is fed forward by the hand wheel. The amount ground off is gauged by the left hand on the feed wheel handle.

After the first lip is ground, and before the holder is backed away from the grinding wheel, a pointer is set which indicates when both lips are ground alike. There is no adjustment of chuck holders, the rest for the shank of the drill being readily adjustable, and the end stop being adjustable for any length of drill from 16 inches down to a mere stub. The drill point is ground to a helicoidal surface of 59 degrees, and the adjustment for drills of various diameters is obtained by a combination of angles in the sliding holder, giving always the right adjustment when the pointer stands at the figure on the scale corresponding to the diameter of the drill to be ground.

**AN IMPROVED RAIL PUNCH.**

A punch for making bolt apertures in rails, and specially intended to supersede the use of the ratchet



HULME'S RAIL PUNCH.

and drill for such purpose, is illustrated herewith, and has been patented by Mr. Isaac Hulme, of Yaquina, Oregon. On a downward extension of one end of the frame is pivoted a bar adapted to be brought up against the base of the rail and held in engagement with the foot of a vertical arm pivoted to the other end of the frame. This foot passes through the opening in the bar, and has an offset to engage its bottom, as shown in Fig. 1. In one downward arm a punch screw is operated by a wrench, the central line of the screw and punch coinciding with a die held on the inner end of the other arm of the frame, and made in the form of a collar opening into a longitudinal aperture in the arm. As the operator turns the screw in which the punch is fitted, bringing its outer end against the body of the rail, the die in the other arm resting against the opposite face of the rail, the punch forces an aperture in the body of the rail, the punched part passing into the opening in the die corresponding with the punch. The device is designed to be very simple and durable, and has a handle for conveniently moving it from place to place.

THE plant now employed on the Manchester ship