(No Model.)

J. SCHWEITZER.

GRINDING MILL.

No. 406,779. Patented July 9, 1889.

FIG. 1

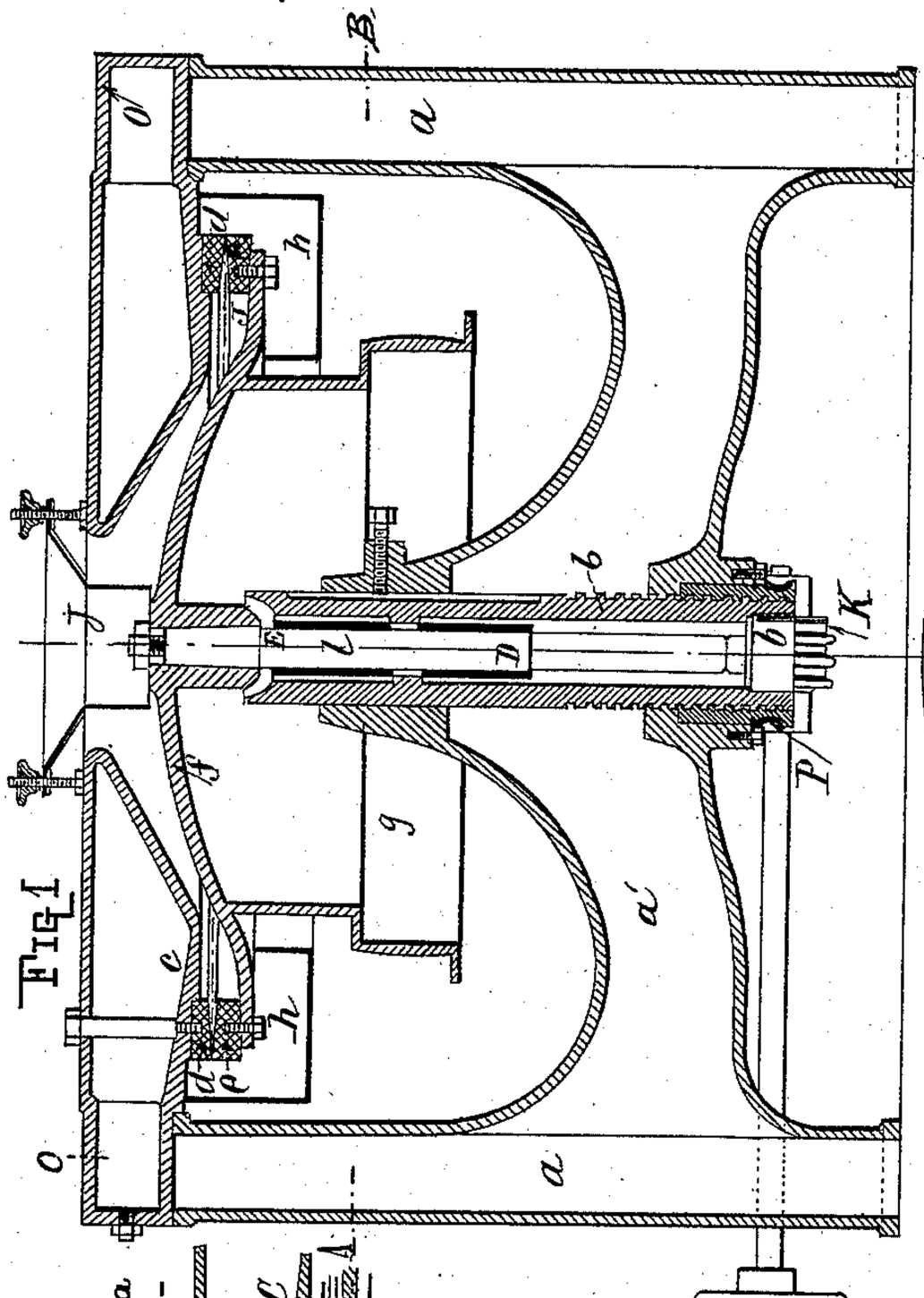


FIG. 2

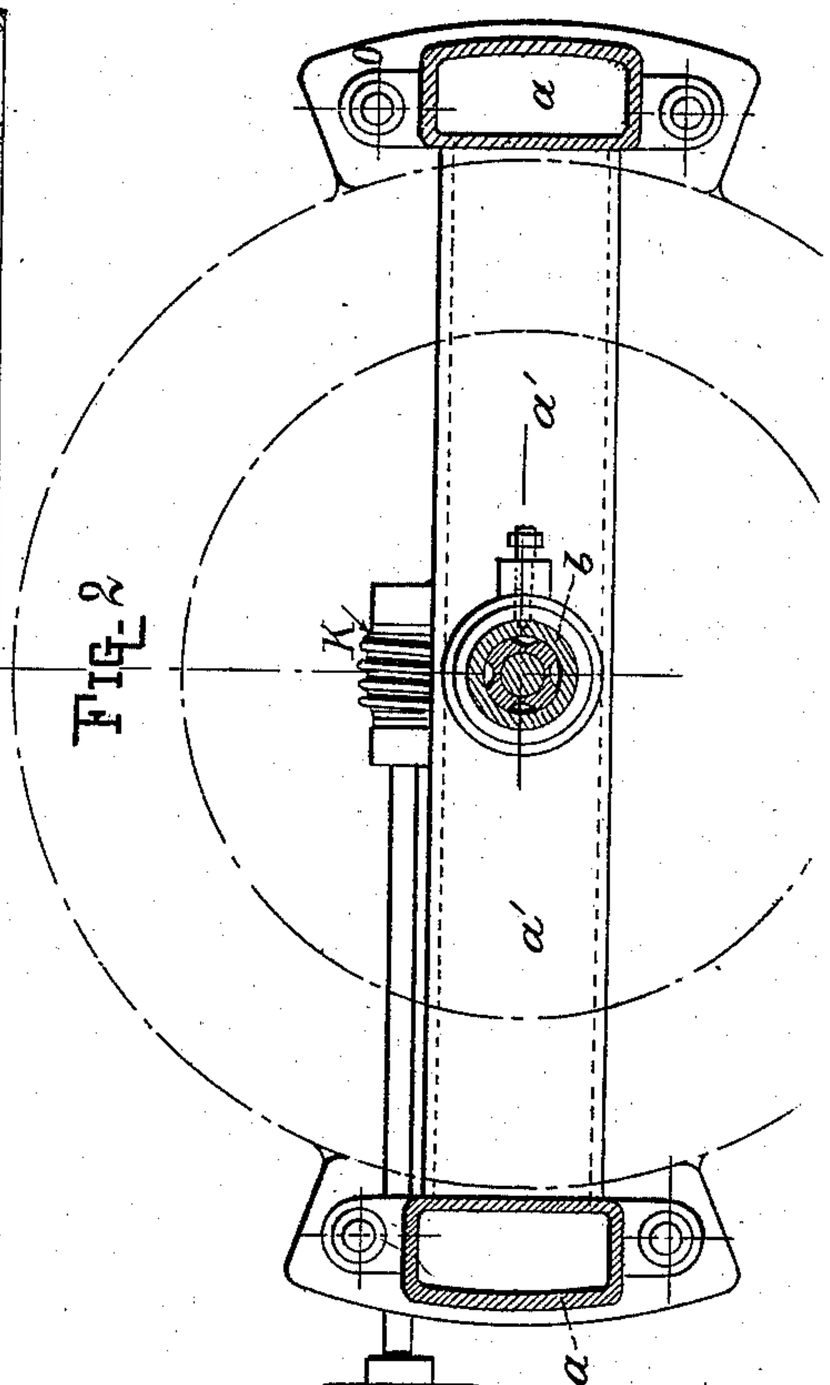


FIG. 1ª

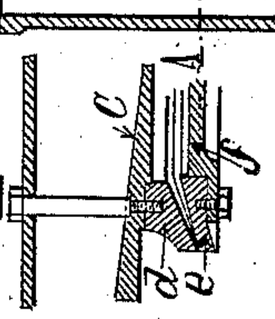
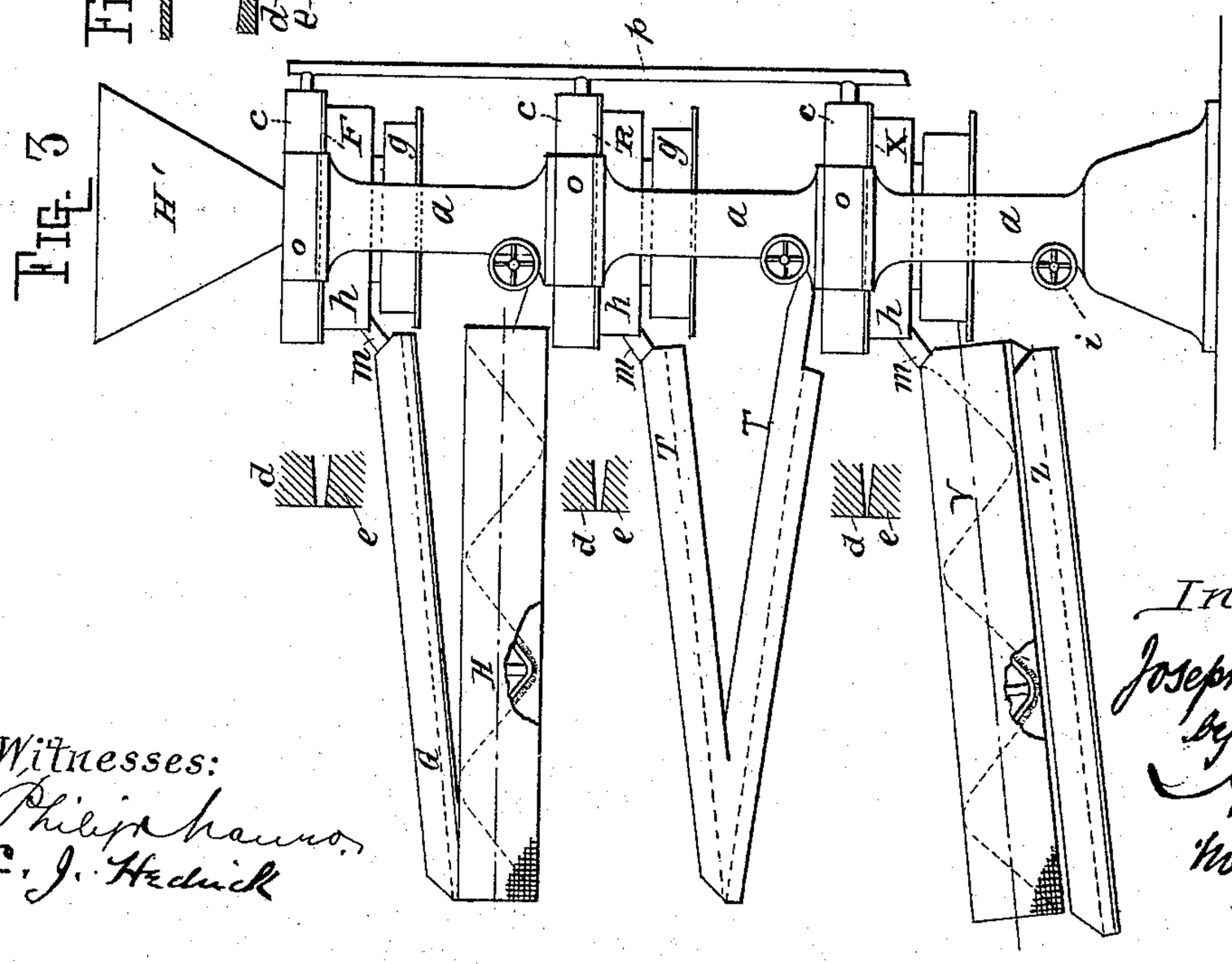


FIG. 3



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UNITED STATES PATENT OFFICE.

JOSEPH SCHWEITZER, OF PARIS, FRANCE.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 406,779, dated July 9, 1889.

Application filed October 6, 1888. Serial No. 287,373. (No model.) Patented in France May 30, 1888, No. 190,915.

To all whom it may concern:

Be it known that I, JOSEPH SCHWEITZER, a citizen of the Republic of France, and a resident of Paris, in said Republic, have invented certain new and useful Improvements in Grinding-Mills, (for which Letters Patent No. 190,915, dated May 30, 1888, have been obtained in France,) of which the following specification is a full, clear, and exact description.

This invention relates to grinding-mills for carrying on the system of milling by gradual reduction, and it has particular reference both to the general arrangement of the machinery as a whole and to the component parts, the result being the production of a new or improved type of mill which presents the following characteristics:

First. The parts are so constructed, contrived, and arranged as to present the minimum height, thus securing facility in superposing the different mills or pairs of grinders necessary for gradual reduction, and consequently enabling the machinery to be concentrated in one story and elevators to be dispensed with.

Second. The constant vertical position of the arbor carrying the revolving grinder is secured by the supporting means, which are of such nature as to assure that when the arbor is drawn to one side, in consequence of the wear on that side under the stress put on the arbor by the means for imparting motion to the grinder, displacement is equal at all points on said arbor, and its axis is consequently always parallel with its original vertical position. This supporting means is of great importance with metallic grinders, since it is very important for the production of flour in a state of perfect pulverization that no part of the material should escape without having been acted upon by the edges of the grooves in passing across them, and it is necessary in order to arrive at this result to have, so to speak, a "mathematical parallelism" between the two grinders. Moreover, for the gradual reduction necessitating successive passages through the different mills, I have invented an arrangement according to which the superposed mills are reduced to their minimum height and are provided with accessories suitable for brushing or cleaning and sifting the different products and at the same time obtaining an automatic feed to the different mills.

Third. The stationary grinder may be constantly cooled by a circulation of cooling-fluid, such as water or air.

A detailed description will next be given of one of the new or improved mills, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical central section of a single mill or apparatus containing a pair of grinders. Fig. 1ª is a partial section, enlarged, of a slightly-modified form of grinders. Fig. 2 is a horizontal section on line A B of Fig. 1, and Fig. 3 is an elevation of a battery of three superposed mills with their accessories arranged for gradual reduction.

Each single mill (see Figs. 1 and 2) has the supporting-frame *a* cast with a double bracket *a'*, which connects the legs of the frame and supports the step and tubular bearing *b* for the arbor *l* of the lower revolving grinder *e*. This bearing surrounds the arbor *l* for nearly its whole length and forms an oil-reservoir therefor, so that said arbor is bathed in oil. It is threaded on the outside at the bottom, and can be moved in a vertical direction by means of a nut P, which is supported and turns in the lower part of the bracket *a'* and engages the threaded extremity of the bearing *b*. It is turned by means of the endless screw K on the shaft of hand-wheel *i*, engaging a worm-wheel on the nut P. By turning the wheel *i* in the proper direction the bearing *b* can be raised or lowered so as to adjust the distance between the grinders *d e*.

Instead of threading the bearing, other suitable adjusting means may be provided, such as a lateral rack with helicoidal teeth engaged by an endless screw, to which motion is communicated from a hand-wheel.

At the top of the frame *a* is an annular crown *c*, under which the stationary grinder *d* is fastened. This crown is made hollow, and a circulation of air or water can be maintained through it, so as to cool the upper grinder, and thus prevent the grist from heating. For this purpose a pipe *p* is shown in Fig. 3. The crown is supported by the

wings O, to which ears on the frames *a* (see Fig. 2) are bolted.

The lower grinder (counterpart of the preceding) is fastened on a plate *f*, fixed solidly on the upper end of the arbor *l* and provided with a pulley *g*, which is in one piece therewith. The arbor *l* rests at the bottom in the step at the lower end of the bearing *b*, and is kept upright by bushings or bearing-blocks extending the whole height of the bearing *b* or arranged at determined points therein, which should be as near as may be to its extremities, so as to give a great stability to the arbor and to provide bearing or contact surfaces corresponding to the stress put thereon by the means for imparting motion to the grinder *e*.

The grain or material to be reduced or ground is introduced through the hopper *j*, passes between the grinders *d e*, and falls into the annular collecting-chamber *h*, from which it escapes by a spout *m*, Fig. 3.

The wings O, being flat, permit a series of mills to be superposed one above the other, as shown in Fig. 3, the said wings fitting between the frames *a* of the two adjacent mills, and with a view to this superposition all the parts are reduced in height as much as possible. The use of a single tubular step-bearing for the rotating arbor conduces to this reduction in height.

A point of the greatest importance, in order that the reduction of the grain may take place under good conditions, is that the arbor *l* remains strictly vertical, so that in consequence of this strictly vertical position the rotating grinder remains quite horizontal. To obtain this result it is necessary that the wear on the bushings or bearing-blocks for the arbor be quite uniform in all parts, and in order to secure uniform wear that the stress due to the pull or thrust of the means for imparting motion should be distributed symmetrically on opposite sides of the line of pull or thrust. To secure this necessary condition I have adopted the arrangement indicated in Fig. 1—that is to say, I make the middle circle of the pulley *g* to lie in a plane equidistant from parallel planes through the middle of the bushings or bearing-blocks D E of the arbor *l* if these bushings or blocks are of equal length, or I make the respective distances inversely proportional to the contact or bearing surfaces if the bushings or bearing-blocks are unequal in length.

By means of this new or improved mill of small height I have been led to produce the new or improved machinery for gradual reduction shown in Fig. 3. It comprises, first, a splitting-mill F, supplied from a hopper H′, and provided with a black-flour sieve G for sifting the broken grain from the mill F, and with a brush-purifier H for detaching the powder adhering to the interior of the lobes of split wheat, as well as the germs; second, one or more reducing-mills R for granulating the kernels of wheat, so as to form semolina and grits, which products are sifted by the chop or meal sieves T; third, a finishing-mill X, followed by a bran-brush V and a flour-sieve Z. These sieves can be replaced by bolting-cylinders, and the return of the products to be ground can be effected by Archimedean screws. This new disposition permits elevators to be dispensed with and the milling machinery to be concentrated in the same story, diminishes the surface occupied, and simplifies the mechanical parts employed.

I claim as my invention—

1. In combination with the machine-frame and stationary horizontal upper disk-grinder, the revolving horizontal lower disk-grinder, the upright revolving arbor having the said lower grinder mounted thereon, and the vertically-adjustable tubular step-bearing supported upright in said machine-frame and constituting the sole journal-bearing for said arbor, said tubular bearing being closed at the bottom for holding oil, and comprising a tubular portion which extends over nearly the whole length of said arbor, and a step which is attached to and adjusted with said tubular portion and underlies the lower end of the said arbor, substantially as described.

2. The lower revolving grinder and revolving arbor therefor provided with a driving-pulley, in combination with bushings or bearing-blocks on opposite sides of the horizontal plane through the middle of said pulley, the distances of the middle of the bushings or bearing-blocks from said plane being inversely proportional to the length of said bushings or bearings, so as to secure equal wear on both sides of said plane and consequently to maintain the lower revolving grinder always horizontal, substantially as described.

3. The lower revolving grinder and the upright arbor therefor provided with a driving-pulley, in combination with a bearing for said arbor, with bearing-surfaces of equal length on opposite sides of the horizontal plane through the middle of said pulley and at equal distances from said plane, substantially as described.

4. The combination, with a supporting-frame and a stationary grinder, of a revolving grinder, an upright arbor, an adjustable tubular step-bearing supported in said frame, and composed of a tubular portion extending over nearly the whole length of said arbor, and a step attached to and adjustable with said tubular portion, and a pulley in the same horizontal plane with a portion of said tubular step-bearing, mounted with said revolving grinder on the said upright arbor, substantially as described.

5. The combination, with a supporting-frame and a stationary grinder, of a revolving grinder, an upright arbor, an adjustable tubular step-bearing supported in said frame and constituting the sole journal-bearing for said arbor, and a pulley mounted with said

revolving grinder on said upright arbor and arranged in the same horizontal plane with a portion of said tubular step-bearing, the latter being composed of a tubular portion and a step attached thereto and adjustable therewith, and its tubular portion being provided with bearing-surfaces on opposite sides of the horizontal plane through the middle of said pulley and at distances from said plane which are inversely proportional to the respective lengths of said bearing-surfaces, substantially as described.

6. The series of superposed mills for gradual reduction, each provided with a hopper for the grist and a collecting-chamber with a side delivery for the chop or meal, and each composed of its individual frame with legs, its individual vertical arbor adjustable in its own frame independently of the other arbors, and a pair of grinders, the mills of the series being each supported by the legs of its own frame resting on the frame of the mill below outside the hopper thereof, in combination with sieves and purifiers arranged at the side of the series of mills, receiving the chop or meal from the collecting-chamber of a higher mill and delivering the sifted or purified material as grist into the hopper of the next lower mill, substantially as described.

7. The series of superposed mills for gradual reduction, composed each of a pair of legs, a double bracket connecting said legs, a vertically-adjustable arbor supported in bearings by said bracket, a revolving disk-grinder mounted on said arbor, a stationary disk-grinder, and a stationary crown supporting said stationary grinder, the crown in each mill having extensions which rest upon the tops of the legs in its own mill and form rests or supports for the legs of the mill above, substantially as described, in combination with sieves and purifiers set at one side of the series of mills in the vertical space between each pair of disk-grinders and the pair below, as set forth.

8. A mill composed of a frame having legs connected by a double bracket, a vertically-adjustable tubular step-bearing supported in said bracket, and composed of a long tubular portion and a step attached thereto and adjustable therewith, an upright arbor in said tubular portion, with its lower end resting on said step, a plate-pulley and grinder mounted on said arbor, with the pulley in the same horizontal plane with a portion of said step-bearing, which it surrounds, the crown supported by said legs, the stationary grinder fastened under said crown, the hopper for the grist, and the annular chamber and spout for the chop, substantially as described.

9. The combination, with a supporting-frame and a stationary grinder, of a revolving grinder, an upright arbor, an adjustable tubular step-bearing supported in said frame, and composed of a tubular portion extending over nearly the whole length of said arbor, and a step attached to and adjustable with said tubular portion, and a pulley in the same horizontal plane with a portion of said tubular step-bearing and supported from said revolving grinder on the said upright arbor, substantially as described.

10. The combination, with a supporting-frame and a stationary grinder, of a revolving grinder, an upright arbor, an adjustable tubular step-bearing supported in said frame and constituting the sole journal-bearing for said arbor, and a pulley secured to and depending from said revolving grinder and arranged in the same horizontal plane with a portion of said tubular step-bearing, the latter being composed of a tubular portion and a step attached thereto and adjustable therewith, and its tubular portion being provided with bearing-surfaces on opposite sides of the horizontal plane through the middle of said pulley and at distances which are inversely proportional to the respective lengths of said bearing-surfaces, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOSEPH SCHWEITZER.

Witnesses:
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R. J. PRESTON.