No. 891,650. PATENTED JUNE 23, 1908.

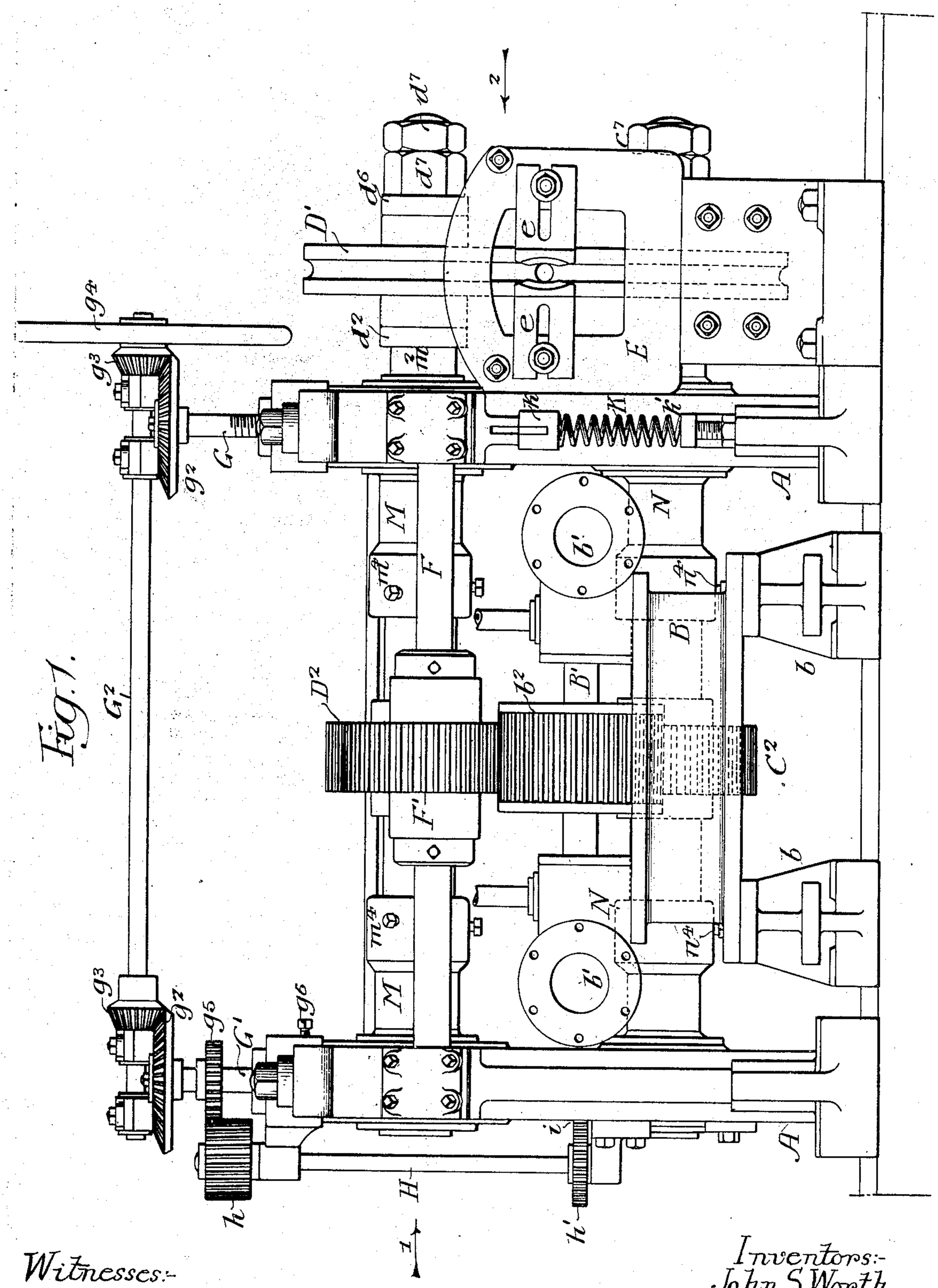
J. S. WORTH & W. F. HARRISON.

TUBE SIZING MILL.

APPLICATION FILED AUG. 22, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



Witnesses:-
William A. Rivoir.
Augustus B. Coppes.

Inventors:-
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3 SHEETS—SHEET 2.

Fig. 1.

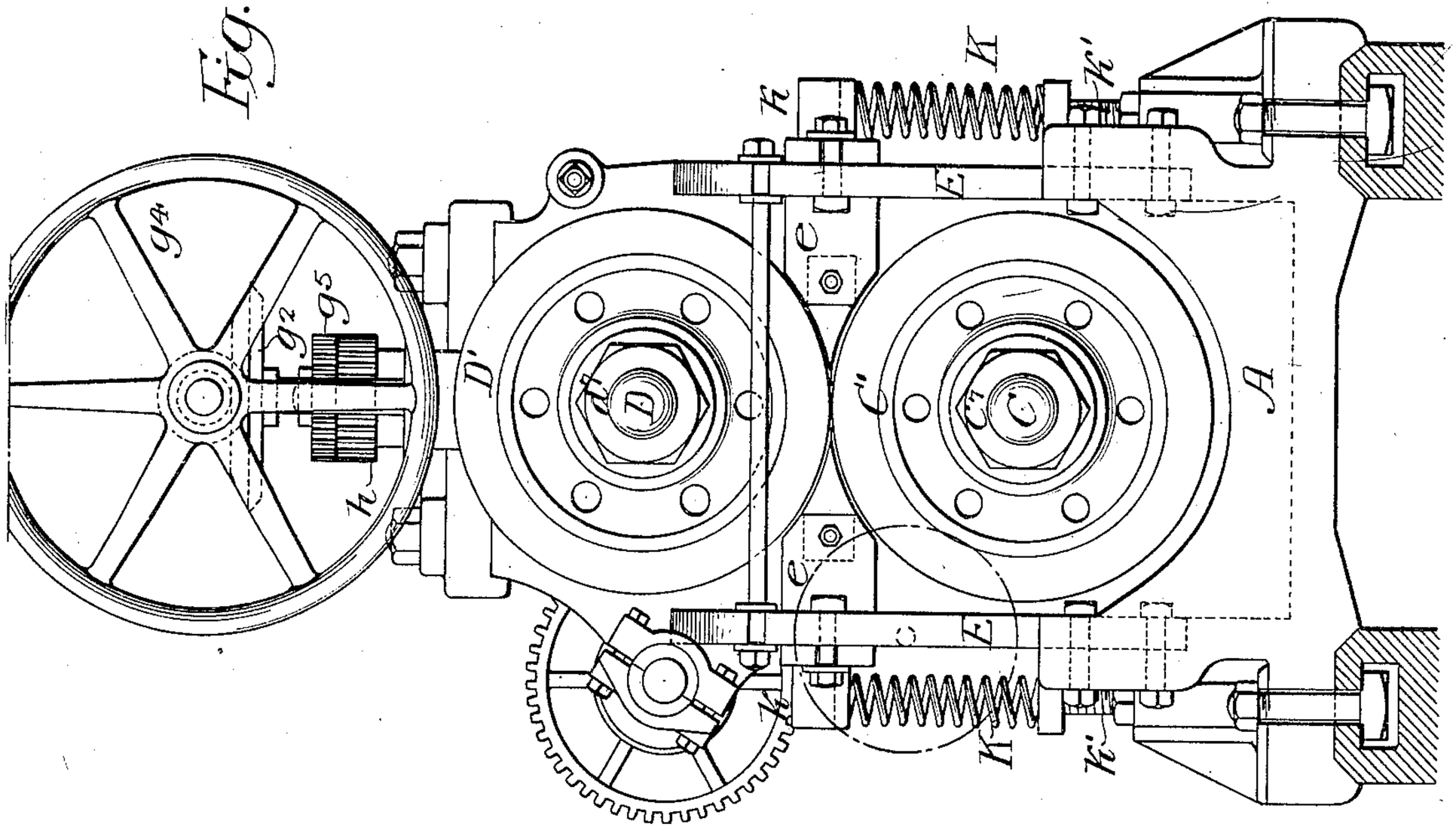
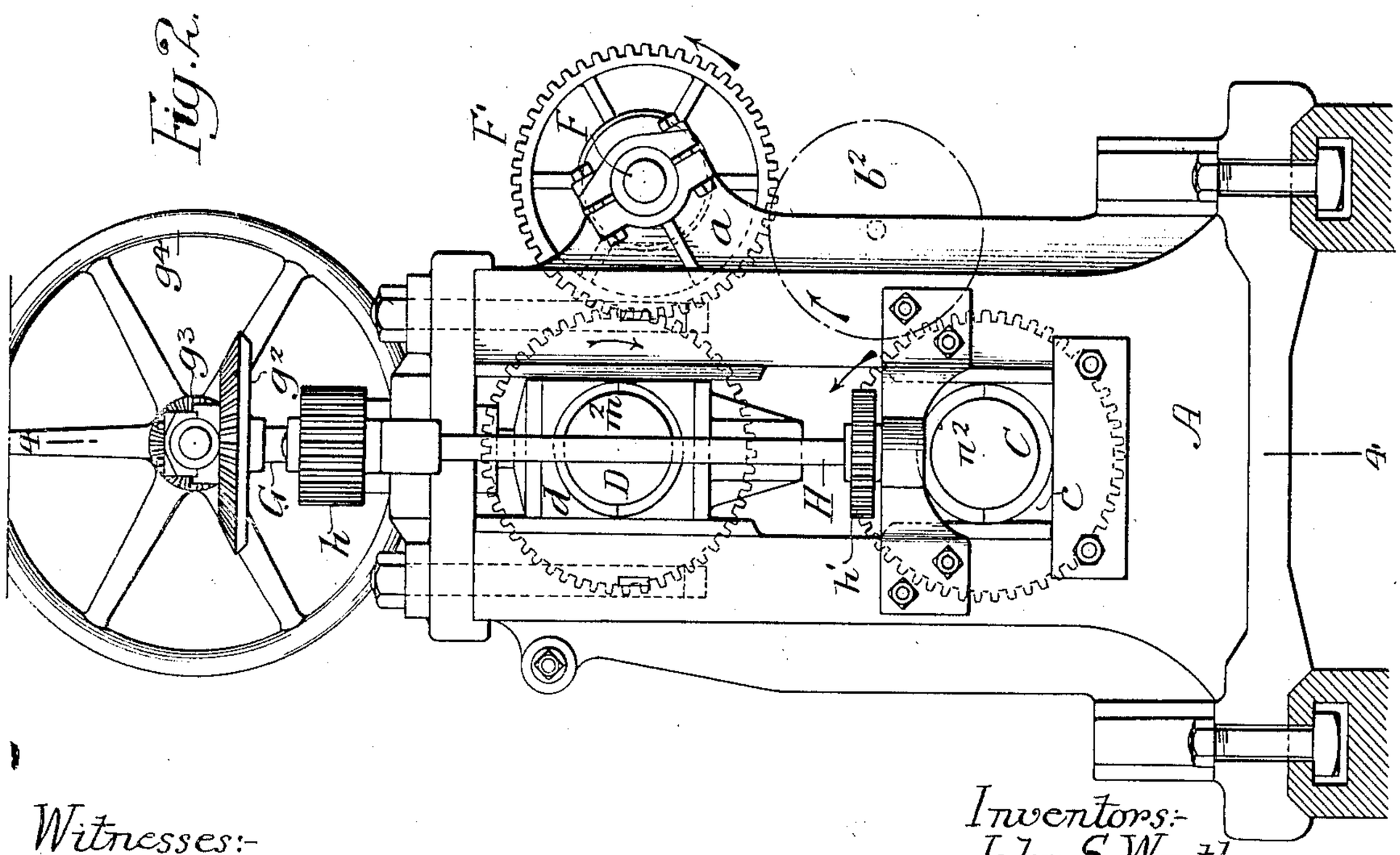


Fig. 2.



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Augustus B. Coppes

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3 SHEETS—SHEET 3.

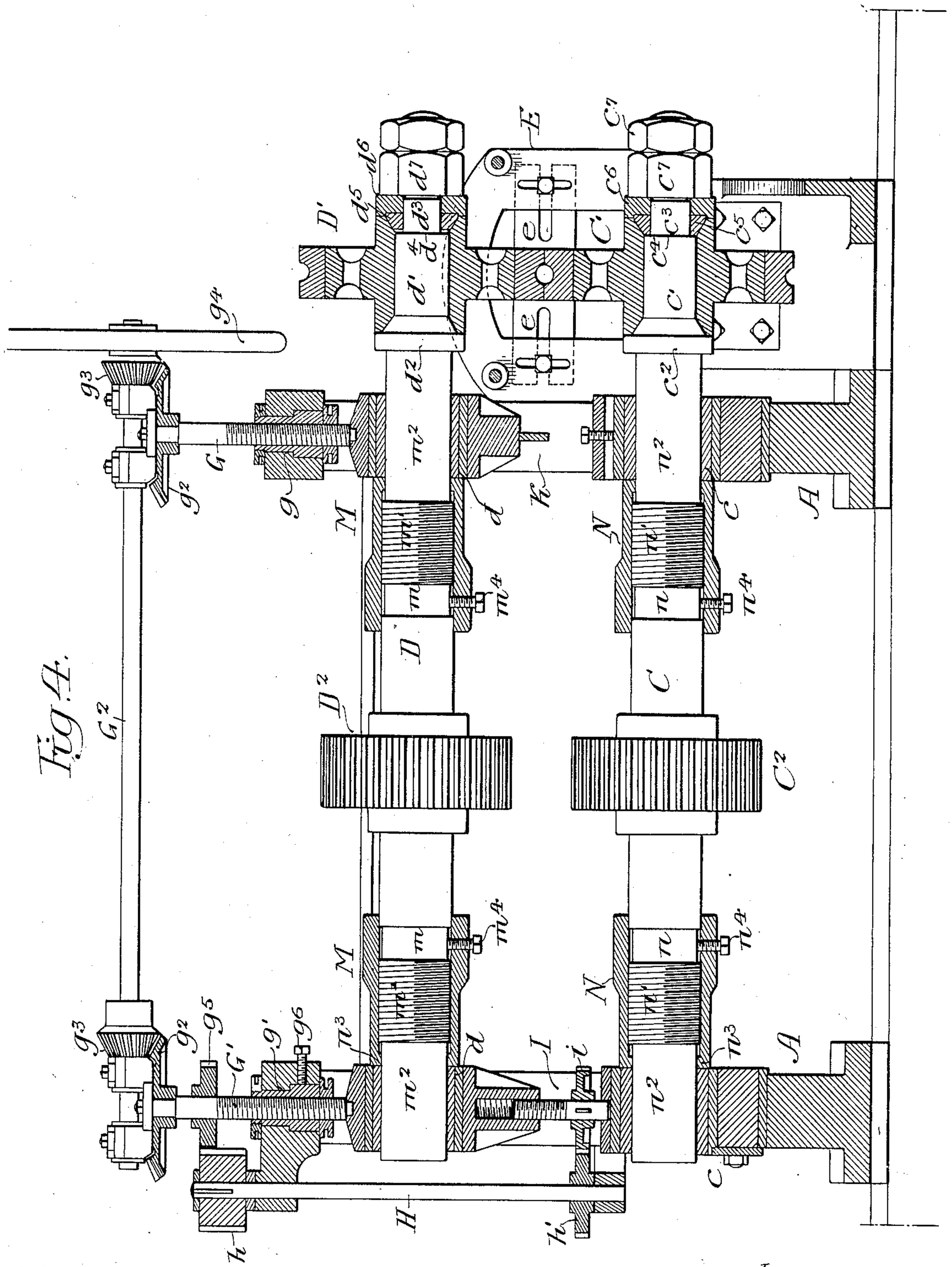

Fig. 4.

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William F. Harrison,

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UNITED STATES PATENT OFFICE.

JOHN S. WORTH AND WILLIAM F. HARRISON, OF COATESVILLE, PENNSYLVANIA, ASSIGNORS TO SAID JOHN S. WORTH AND WILLIAM P. WORTH, OF COATESVILLE, PENNSYLVANIA.

TUBE-SIZING MILL.

No. 891,650. Specification of Letters Patent. Patented June 23, 1908.

Application filed August 22, 1906. Serial No. 331,596.

To all whom it may concern:

Be it known that we, JOHN S. WORTH and WILLIAM F. HARRISON, citizens of the United States, residing in Coatesville, Pennsylvania, have invented certain Improvements in Tube-Sizing Mills, of which the following is a specification.

Our invention relates to certain tube sizing machines used in tube mills for reducing a tube to the proper diameter throughout.

The object of our invention is to provide a machine which can be readily and accurately adjusted, and to also provide means for securely clamping the rolls to the shaft so that all lost motion will be taken up.

Referring to the accompanying drawings:—Figure 1, is a side view of our improved tube sizing machine; Fig. 2, is an end view looking in the direction of the arrow 1, Fig. 1; Fig. 3, is a view looking in the direction of the arrow 2, Fig. 1; and Fig. 4, is a vertical sectional view on the line 4—4, Fig. 2.

A, A are the housings of the machine; B is the bed plate of the engine mounted on suitable supports *b*, *b* and carrying the cylinders *b'* and engine shaft B'. On this shaft is a gear wheel b^2 which meshes with the wheels carried by the shafts mounted in the housings A, A.

Any suitable type of engine may be used for driving our improved sizing mill. In the present instance we have shown a two cylinder horizontal steam engine.

C is the lower shaft of the mill mounted in suitable boxes *c*, *c* carried by the housings *a*, *a*. These boxes are preferably split boxes, and are constructed as shown in Figs. 2 and 4. The boxes and the shaft are held firmly to the housings, and the shaft is not vertically adjustable in the present instance.

D is the upper shaft mounted in suitable boxes *d*, *d*. This shaft is vertically adjustable, and the boxes are independently adjustable so that the rear end of the shaft can be adjusted independently of the front end.

Carried by the outer end of each shaft C and D are rolls C' and D' respectively. These rolls are grooved as illustrated in Fig. 4, to the proper size of the tube to be sized, and the tube is caught between these rolls and reduced to its proper size. In making the rolls we prefer to construct them as illustrated in Fig. 4, the body of each roll being made independently of the grooved rim so that the rim can be replaced when necessary.

One object of this invention is to secure the rolls to their shafts in such a manner as to absolutely prevent any lost motion whatever after adjustment is made and at the same time allow them to be easily removed; therefore we construct the shafts and the rolls in the following manner: The shaft C is reduced at *c'* and has a beveled collar c^2 at the inner end forming a tapered shoulder. The shaft is further reduced at c^3 forming another shoulder c^4, and on this reduced portion is a tapered sleeve c^5 split longitudinally of the shaft preferably into two or more pieces so that it can close tightly on the shaft without coming together at the split and preferably doweled together. The opening through the hub of the wheel C' is bored to fit snugly over the portion *c'*, and is countersunk at each end to correspond with the bevel c^2 and the split ring c^5. Back of the ring c^5 is a washer c^6, and on the threaded portion of the shaft are nuts c^7 on turning which the washer is forced against the ring c^5 and the ring is forced into the hub *c'* closing it tightly on the shaft and causing the hub in turn to be forced onto the beveled collar c^2; thus any lost motion is entirely taken up by the beveled portions, and in fact the hub of the roll is held between the beveled portions of the shoulder and ring so that if the opening in the hub should be greater in diameter than the portion *c'* of the shaft the roll will be held rigidly in place and all lost motion will be taken up. The coupling between the shaft D and the roll D' is similar to that just described in reference to the shaft C'.

The shaft is reduced at *d'* and is provided with a beveled shoulder d^2, and is reduced at d^3, forming a shoulder d^4, and on this reduced portion is a split sleeve d^5, and back of the sleeve is a washer d^6 held in place by the nuts d^7.

We preferably arrange at the front and back of the rolls D' and C' frames E secured to the housing in any suitable manner and carried by these frames are side guides *e*, *e*, for directing the tubes to and from the rolls. The guides are vertically and horizontally adjustable, the frames being slotted as well as the guides for the reception of securing bolts. Other means of adjustment may be shown without departing from the essential feature of the invention.

On the shaft C is a gear wheel C^2 which meshes with the gear wheel b^2 on the driving shaft B′ of the engine. On the shaft D is a gear wheel D^2 which meshes with an intermediate gear F′ on the shaft F carried by bearings *a* on the housings. The gear wheel F′ also meshes with the wheel b^2 on the engine shaft B′, and by the arrangement of this gearing the two shafts turn so as to feed the tube through the machine.

In order to properly adjust the shaft D we mount screws G G′ in nuts *g*, *g′* in the housings A A, the screws resting on the upper halves of the boxes *d*, *d* as clearly illustrated in Fig. 4. On the upper end of these screws G, G′ are beveled gear wheels g^2 which mesh with bevel pinions g^3 on the cross shaft G^2 having a hand wheel g^4 so that on turning the hand wheel both screws G G′ will be turned in unison either to lower or raise the boxes, as desired.

Secured to the screw G′ is a pinion g^5 which meshes with an elongated gear wheel *h* secured to a vertical shaft H. This shaft has at its lower end a gear wheel which meshes with a gear wheel *i* on a vertical screw I adapted to a threaded opening in the lower half of the box *d*. The screws G′ and I are threaded in the reverse direction in the present instance, one having a right hand thread and the other a left hand thread, so that when the screw G′ is turned in one direction it will be raised, the other screw being turned so that it will raise the box; when the screw G′ is turned in the reverse direction it will be forced downward and the lower screw will be turned so as to draw the box down, thus the box is kept confined at all times between the two screws, both screws can be either right or left hand as desired by inserting an idler pinion between wheel g^5 and wheel *h* or between wheel *j* and wheel *h′* or the lower screw can be inverted with the nut forming the lower support.

It will be noticed that the nut *g′* in the housing A is secured to the housing by a set screw g^6 so that when it is desired to move one screw independently of the other, for the purpose of adjustment or the taking up of lost motion in the shaft journal m^2, the set screw is turned to release the nut so that it will turn in its box.

By having the elongated gear wheel *h* the screw can be fed up and down without the pinion g^5 becoming out of mesh with the gear wheel *h*. By this arrangement any suitable adjustment of the rear end of the shaft can be made to bring the rolls D′ and C′ in proper alinement, or for raising or lowering the shaft D for different sizes of rolls.

The box *d* at the forward end of the machine is secured on a bar *k* extending across the machine, and mounted under the bar at each side of the machine, as illustrated in Figs. 1 and 3, are coiled springs K which rest on screw studs *k′* adjustable in the housings A. Thus when the screw G is turned to adjust the forward box, the springs take up any slack.

It will be seen by the above that the leverage exerted by the upper shaft when the pressure is between the rolls tends to force the rear end of the shaft downward and to resist this we use the screw I, the screw G resists the pressure at the forward end, the springs simply keep the box in place.

We preferably make the shafts C and D in the manner which we will now proceed to describe.

In order to adjust the shafts longitudinally so as to bring them in alinement and hold them there, we preferably provide sleeves which are adjustably mounted on the shafts and adjust these sleeves against the boxes so as to take up lost motion.

Referring to Fig. 4, the shaft C is reduced at *n* and n^2, and threaded at *n′*, and on each threaded portion *n′* is a sleeve N which rests against the inner surface of one of the bearing boxes. The sleeves have internal flanges n^3 and their ends lap over the central portion of the shaft beyond the reduced portion *n* so that each sleeve is guided on the two smooth portions of the shaft. After adjustment the sleeves are held in position by set screws n^4. Thus it will be seen that the shaft can be moved longitudinally to any position desired and held rigidly against any lost motion after the sleeves N, N are adjusted and secured in their adjusted position.

The shaft D is reduced at *m*, m^2, and has a threaded portion *m′* on which the sleeves M, M are mounted, and each sleeve has an internal flange m^3 and extends over the enlarged portion of the shaft D so that the sleeve will have a bearing on two plain portions of the shaft similar to the sleeve N, and the sleeves are held in the adjusted position by screws n^4.

We claim:

1. The combination of a shaft, a tapered collar on the shaft, a split sleeve on the shaft, and means for forcing the split sleeve towards the collar, a roll mounted on the shaft between the sleeve and the collar, and countersunk at each end to the same taper as the tapered collar and tapered sleeve, substantially as described.

2. The combination in a tube sizing mill, of the housings, upper and lower shafts, a sizing roll carried on the end of each shaft beyond the housings, bearing boxes for the shafts, two screws, one mounted above and the other mounted below the rear box of the upper shaft, means for connecting the screws and means for turning one of said screws so that when one screw is turned the other screw will be turned, whereby the box is vertically adjusted and positively held in its adjusted position to resist the pressure against

the roll of the upper shaft, substantially as described.

3. The combination in adjusting means for the rear end of a shaft, of a housing, upper and lower shafts, a fixed box for the lower shaft, a box movable vertically in the housing adapted to receive the upper shaft, an adjusting screw bearing upon the upper portion of the box, an adjusting screw adapted to the threaded opening in the lower portion of the box, a vertical shaft, gearing between the vertical shaft and the upper screw, and gearing between the vertical shaft and the lower screw so that when the upper screw is turned the lower screw will be turned in unison therewith, whereby the roll shaft can be vertically adjusted and locked rigidly in the position to which it is adjusted, substantially as described.

4. The combination of two housings, a box in each housing, a shaft mounted in the boxes, said shaft having two threaded portions near each box, both threaded portions being between the housings, a screw sleeve on each threaded portion, the ends of the said sleeves arranged to bear against the inner side of the boxes, means for locking the screw sleeves in the position to which they are adjusted, so that when the sleeves are turned the shaft can be adjusted longitudinally and the sleeves can be locked in their adjusted position to prevent longitudinal movement in either direction, substantially as described.

5. The combination of a box, a shaft having a screw threaded portion and a reduced portion at one side of the screw threaded portion extending into the box and having a groove on the other side of the threaded portion, an internally threaded sleeve mounted on the screw threaded portion of the shaft and having plain portions at each end, one plain portion being in the form of an internal flange arranged so as to slide upon the plain portion of the shaft, and means on the sleeve adapted to engage the grooved portion so as to secure the sleeve to the shaft after adjustment, substantially as described.

In testimony whereof, we have signed our names to this specification, in the presence of two subscribing witnesses.

JOHN S. WORTH.
WILLIAM F. HARRISON.

Witnesses:
S. G. Cook,
William S. G. Cook.