(No Model.) 2 Sheets—Sheet 1.

A. J. SHAW.

PAWL AND RATCHET MECHANISM.

No. 528,614. Patented Nov. 6, 1894.

Fig. 1.

ON LINE 1—1

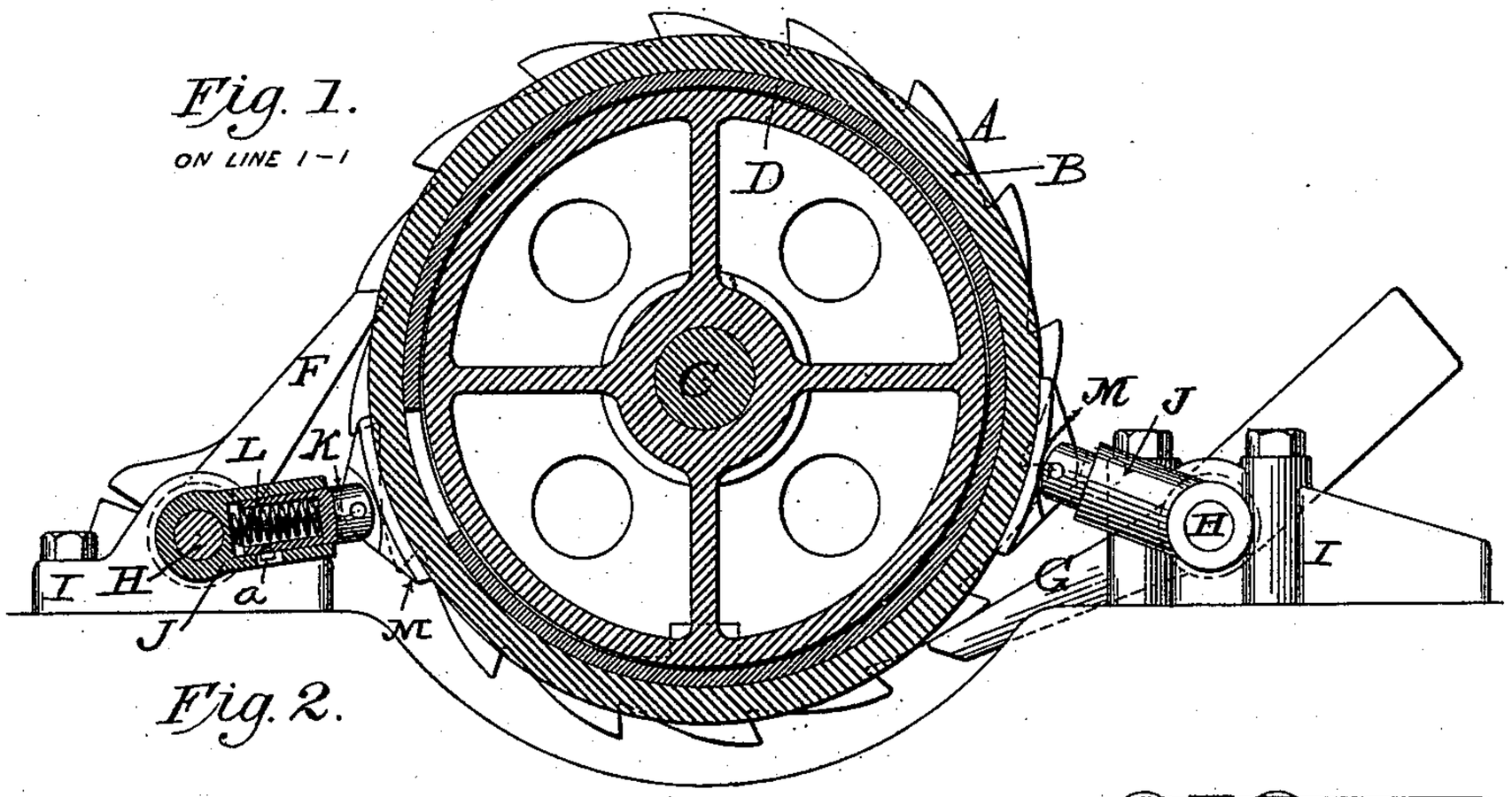


Fig. 2.

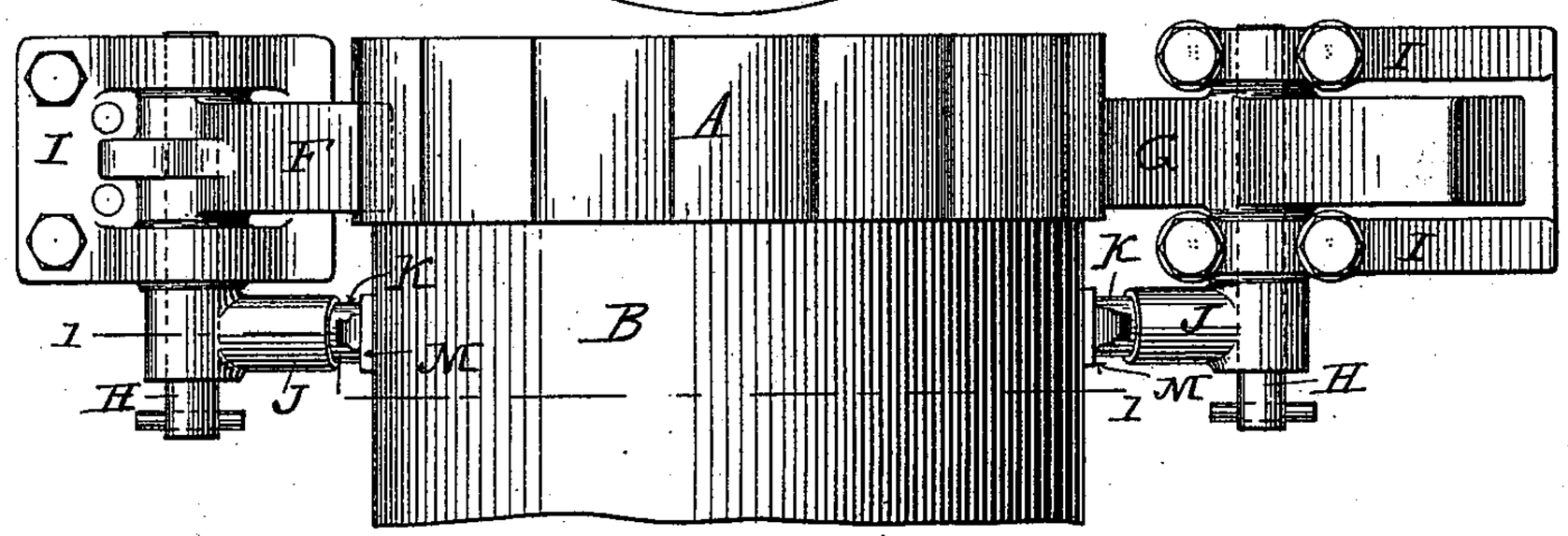
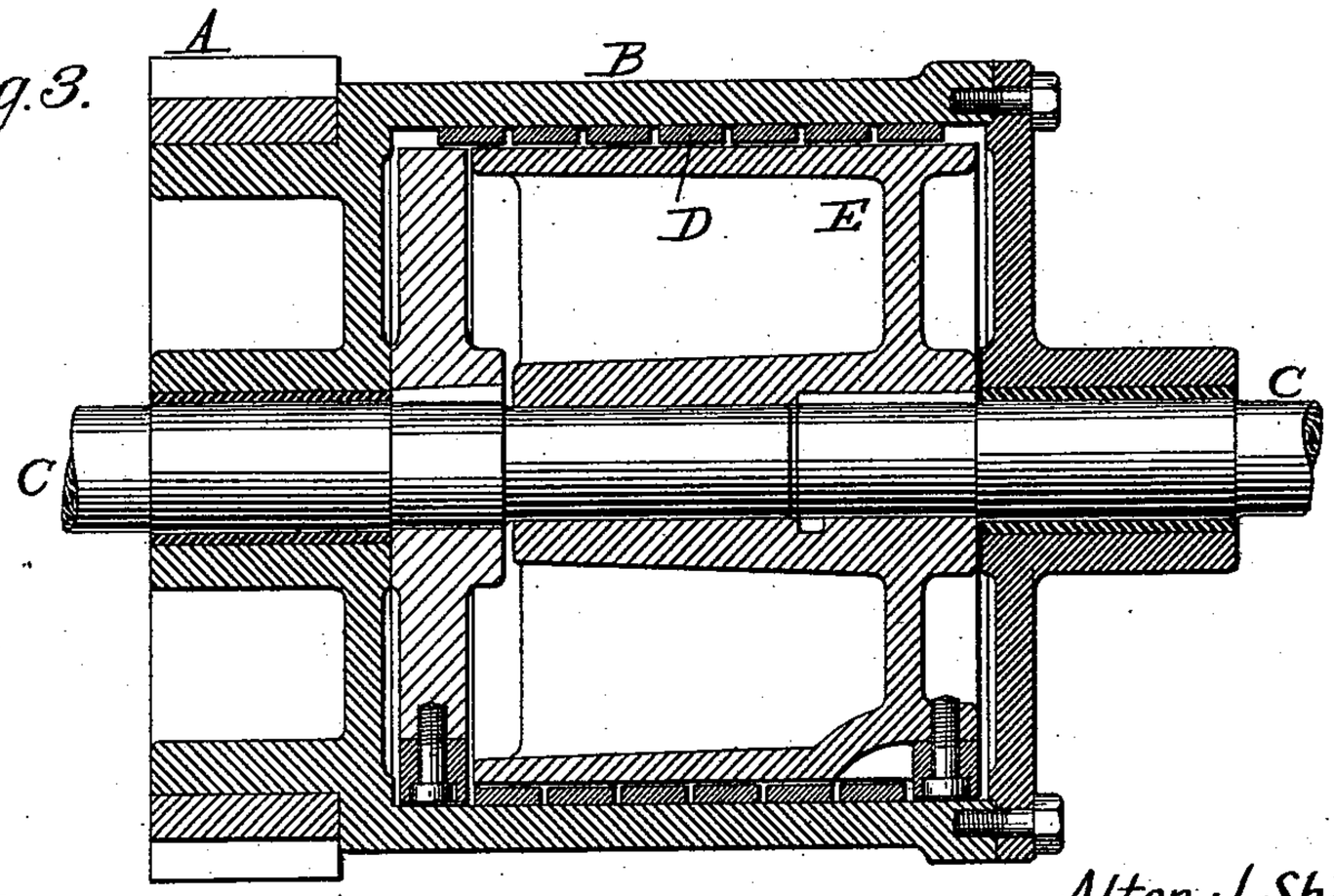


Fig. 3.



Witnesses,
Sidney P. Hollingsworth
C. B. Bull

Alton J. Shaw,
Inventor,
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Dodge & Sons,

(No Model.) 2 Sheets—Sheet 2.

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PAWL AND RATCHET MECHANISM.

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Fig. 4.

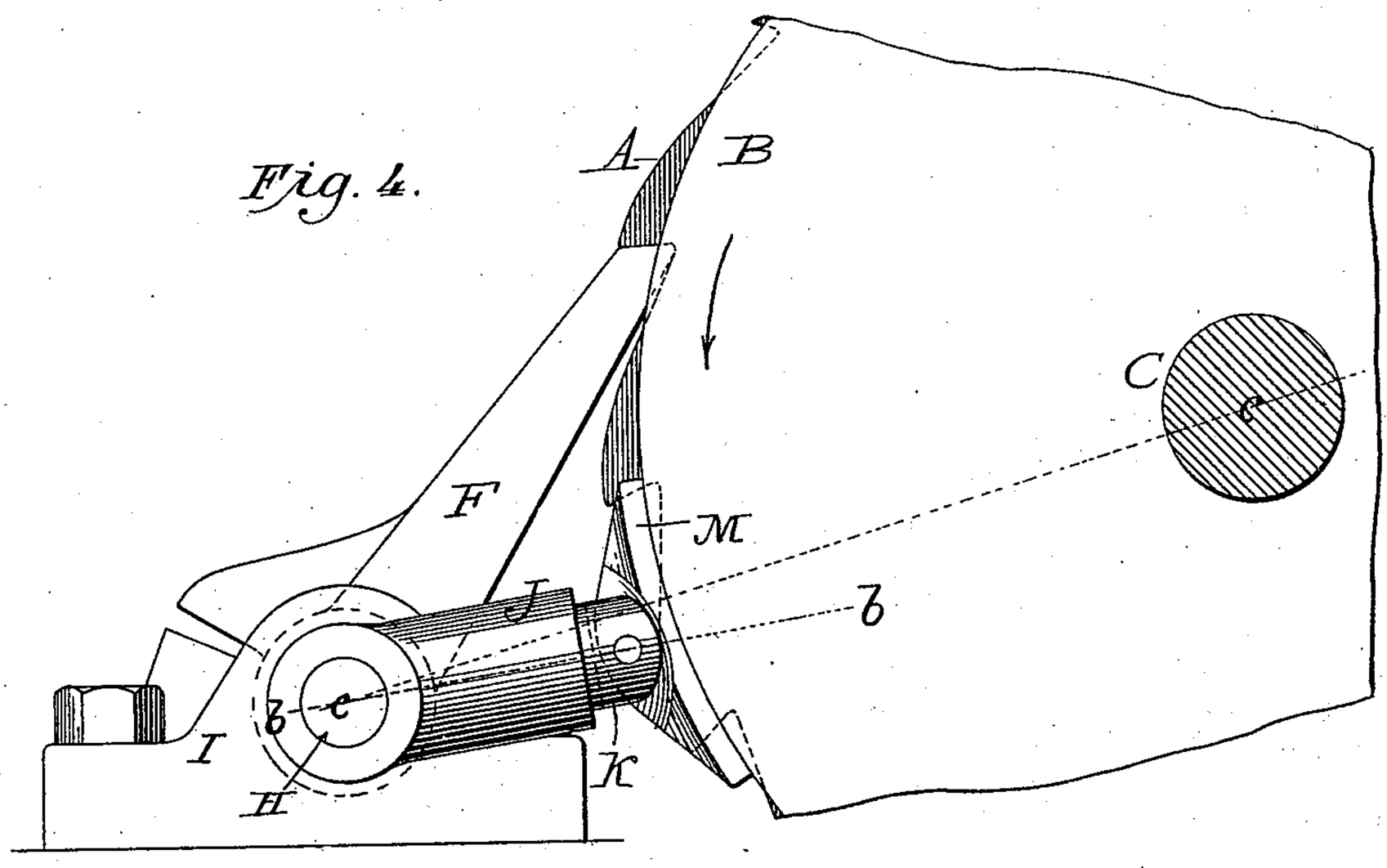
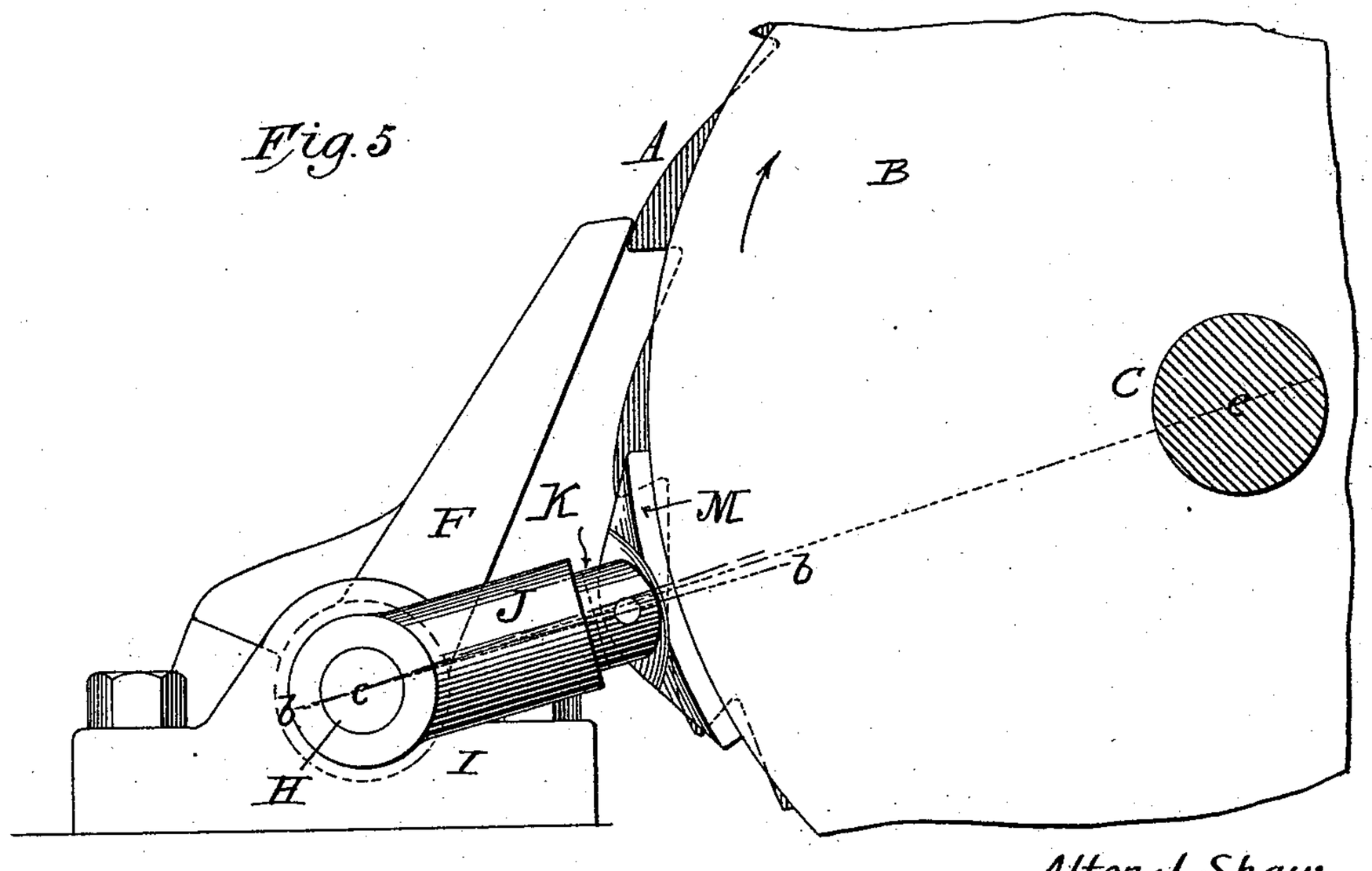


Fig. 5



Witnesses,
Sidney P. Hollingsworth
C. B. Bull

Alton J. Shaw
Inventor,
by his attorneys,
Dodger & Sons,

UNITED STATES PATENT OFFICE.

ALTON J. SHAW, OF MUSKEGON, MICHIGAN, ASSIGNOR TO THE SHAW ELECTRIC CRANE COMPANY, OF SAME PLACE.

PAWL-AND-RATCHET MECHANISM.

SPECIFICATION forming part of Letters Patent No. 528,614, dated November 6, 1894.

Application filed June 7, 1894. Serial No. 513,843. (No model.)

To all whom it may concern:

Be it known that I, ALTON J. SHAW, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Pawl-and-Ratchet Mechanism, of which the following is a specification.

My invention relates to locking pawls or dogs for ratchets, and is designed for general application, wherever such ratchets are used.

The object of the invention is to insure prompt and certain engagement of the dog or pawl with the teeth of the ratchet, to suppress or lessen the noise common to such parts, and to dispense, in certain situations, with counterweights for the pawls or dogs.

In the accompanying drawings I have represented my improved device as applied to an automatic brake mechanism, such as is used by me in connection with electric cranes and hoisting machinery, wherein I find it of great value.

Figure 1 is a sectional view, on the line 1—1 of Fig. 2. Fig. 2 is a top plan view of the mechanism to which my invention relates, showing it combined with the ratchet wheel and brake drum of the automatic brake mentioned. Fig. 3 is a sectional view of said brake mechanism, and Figs. 4 and 5, side elevations of the pawl or dog in and out of engagement with the ratchet wheel.

It is to be understood that the automatic brake here shown forms no part of the present invention, and hence will not be described further than is necessary to make clear the action of the pawl- or dog-controller.

In the practical use and operation of pawls and ratchets it is customary to employ springs or weights to cause the movable pawls to enter into engagement with the teeth; but these cause a considerable amount of noise and more or less wear. In the case of weighted pawls it not unfrequently happens that rapid rotation of the ratchet wheel, or quick movement of the ratchet bar will cause the pawl to be thrown so far back or outward that it will fall and remain away from the ratchet. This is an element of danger, in that it is liable to permit backward movement of the ratchet at a time or under circumstances that would involve serious consequences and even loss of life.

I avoid the noise and wear, and insure prompt and certain engagement by the construction here represented, and which I will now explain.

A indicates a ratchet wheel, secured to or formed with a smooth concentric drum B at one side.

In the drawings the drum B is represented as an elongated hollow shell, but it may be merely a short cylindrical body, solid or hollow, as found expedient in any given case.

In Figs. 1 and 3 the drum B is represented as being loose or free to turn upon a two-part shaft C, one section of which connects with the hoisting barrel or wheel, and the other with the motor, connection being made between the two by a spiral band D of metal, which is wrapped closely and tightly upon an internal drum E carried by one section of the shaft,—expanded and made to bear forcibly against the interior of the outer drum B,—or permitted to assume an intermediate state and position, according to the direction and speed of rotation of one or other part of shaft C.

The brake proper constitutes no part of my invention and hence need not be further described, it being understood, as above mentioned, that any cylindrical drum-like body attached to and rotatable with the ratchet wheel will answer the purposes of the present invention.

Ratchet wheel A is mounted upon a shaft C, which is carried in suitable bearings, and may be either the two-part shaft here shown, or a continuous shaft, or the ratchet wheel may be formed with gudgeons or journals.

F and G indicate two pawls or dogs, each carried by a rockshaft H, supported in a suitable block I. Pawl F having its body and its weight above its pivot and inclining toward the ratchet wheel, tends to fall by gravity toward the wheel and to engage with the teeth thereof; but the body of pawl G being below its pivot, a counterweight is provided, as shown in Figs. 1 and 2. In all other respects the two pawls are alike, and it is entirely feasible to dispense with the counterweight if desired.

The number of pawls is immaterial, a sin-

gle one or a series being employed according to the special conditions of any given case.

Each rockshaft H carries a tubular arm or cylindrical shell J, the body of which is radial to the rockshaft or substantially so. Within the shell J is arranged a piston or plunger K, preferably made hollow as shown in Fig. 1, and within the plunger K, or between its inner end and the inner end of shell J is placed a spring L, which tends constantly to press the plunger K outward. It is manifest that the movable member K may encircle the relatively fixed member J without affecting the action of the parts.

It is deemed advisable to slot the shell J, and to provide plunger K with a stop pin or screw *a*, to prevent the separation of said parts, but this is not essential because when the various parts are assembled these members cannot separate.

M indicates a block or shoe, pivotally secured to the end of plunger or piston K, and curved to conform to the circumference of drum B upon which it bears at all times.

The angular position or adjustment of shell J upon its rockshaft H is such, relatively to that of the pawl F or G, that when the pawl has moved inward behind one of the ratchet teeth, the axial line *b b* Fig. 4 of the shell and plunger is oblique to a straight line *c c*, connecting the center of the rockshaft and the center of the gear wheel, and on the opposite side thereof from that on which the pawl is located. It is desirable also that the relation be such that even when the pawl bears upon the crest of a tooth as shown in Fig. 5 the axial line *b b* of the shell and plunger shall remain slightly out of line with and on the same side of said line *c c* as before, though this is not essential, and the mechanism will operate even though the axial line of the plunger cross and pass slightly beyond the said line *c c*. The outward throw of the pawls or dogs is limited by suitable stops, as indicated in Figs. 1, 2, 4 and 5. The action of the two pawls is precisely the same, and may therefore be conveniently explained in connection with the illustration of either one.

Figs. 4 and 5 represent the pawl F in its two extreme positions, and the operation will be explained with the aid of said figures. First referring to Fig. 4, and assuming the tendency of rotation of the wheel and drum to be in the direction indicated by the arrow in said figure,—the shoe M and pawl F to be at the commencement of said rotation in the positions indicated in Fig. 5,—the lines *b*, *b*, and *c*, *c*, being brought nearly into coincidence,—the spring will be compressed and will press the shoe M in a nearly radial direction against drum B, causing it to bind upon and move with the drum, aided in so doing by the gravity of the pawl F. As the shoe thus moves with the drum, the angle of divergence between lines *b b* and *c c* becomes wider, and after a short travel due to such frictional contact, the spring I, by reason of its tendency to expand or elongate, tends to and usually does, slide the shoe upon the drum and complete the rocking of shaft H necessary to carry pawl or dog F to the base of the ratchet tooth, or to its innermost position. If now, the wheel and drum rotate in a forward direction, as indicated by arrow in Fig. 5, the ratchet tooth beneath the pawl moves said pawl gradually outward until the shoe M reaches a position where its friction upon the drum is sufficient to cause it to bind upon and move with said drum, until the pawl or dog is arrested by the stop provided for that purpose. The adjustment will preferably be such that the pawl or dog shall just clear the teeth of the ratchet when thus thrown out. Further rotation of the drum and ratchet will leave the parts in the relation stated, and shown in Fig. 5, the drum gliding beneath shoe M with but slight and unimportant friction, owing to the comparatively light pressure of spring L and slow motion. The parts are well lubricated in practice to prevent cutting or undue wear, but the slight friction of the parts under these conditions is ample to insure the above described action.

It will be seen that when the pawls are disengaged from the ratchet they remain disengaged until the direction of rotation is reversed, hence the continual hammering of the pawls and the consequent noise and wear incident to ordinary constructions, are avoided. It will likewise be seen that the pawl enters promptly and certainly into engagement with the ratchet, the instant a reverse movement begins, and that owing to the tendency of the spring to elongate, and to the angular direction in which the shoe is pressed at such time, the pawl is prevented from rebounding or flying outward away from the ratchet. This latter feature is one of great importance in that it precludes accidental release or backward movement, so dangerous in hoisting machinery generally but especially so when molten metal is being handled in foundries and steel works.

It is obvious that the device is applicable to ratchet bars and sectors as well as wheels. So too the form of spring used may be varied and in other minor particulars the construction may be modified without departing from my invention, though the construction and arrangement illustrated are deemed best.

Having thus described my invention, what I claim is—

1. In combination with a ratchet, a smooth circumferential bearing surface at one side thereof, a pawl or dog adapted to engage with the teeth of the ratchet, an extensible arm connected with the pawl and provided with an extending spring, and a shoe carried by said arm and adapted to bear upon the smooth bearing surface, substantially as and for the purpose set forth.

2. In combination with ratchet wheel A and smooth drum or surface B concentric therewith, a dog or pawl F adapted to engage with

the teeth of the ratchet wheel, a rockshaft H carrying said pawl, a telescopic arm J, K, carried by the rockshaft and provided with a spring L and shoe M, the shoe being arranged to bear upon the circumference of the drum substantially as described.

3. In combination with a ratchet and with a smooth bearing surface beside and connected with said ratchet, a pivoted pawl or dog adapted to engage with the teeth of the ratchet, an extensible arm connected with the pawl and provided with an extending spring, and a shoe carried by said arm, the parts being so adjusted relatively to each other that the axis of the extensible arm shall be oblique to the surface upon which the shoe bears, when the pawl or dog is in engagement with the teeth of the ratchet.

4. In combination with a ratchet provided with a bearing surface at one side of its teeth, a pivoted pawl or dog adapted to engage with the teeth of said ratchet, an extensible arm connected with the pawl and provided with an extending spring, and a shoe carried by said arm and arranged to rest upon said bearing surface, the arm being adjusted relatively to the pawl substantially as described, whereby the axial line of the extensible arm shall at all times occupy a position oblique to and on the same side of a line extending perpendicularly from the bearing surface to the pivotal center of said arm.

5. In combination with ratchet wheel A carrying smooth bearing surface B; rockshaft H; pawl F and extensible arm J, K, carried by said rockshaft; spring L for extending said arm; and shoe M carried by said arm and arranged to bear upon surface B, the arm and pawl being relatively adjusted substantially as set forth, whereby the axial line *b b* of arm J, K, is caused to stand always on the opposite side of line *c c*, connecting the center of wheel A and shaft H, from that on which the pawl F stands.

6. In combination with a ratchet provided with a smooth cylindrical bearing surface at one side of its teeth movable with the ratchet, a pivoted pawl or dog adapted to engage with the teeth of said ratchet, a spring arm connected with said pawl and a shoe carried by said arm and arranged to rest on said bearing surface; the arm being set or adjusted relatively to said pawl, substantially as described, so that the axial line of the spring arm shall have an angle of oscillation greater on the side opposite the pawl than on the other, of a line extending perpendicularly from the pivotal center of said arm, to said cylindrical bearing surface.

In witness whereof I hereunto set my hand in the presence of two witnesses.

ALTON J. SHAW.

Witnesses:
J. G. EMERY, Jr.,
T. C. AKIN.