8. $$\frac{\partial^2 u}{\partial t^2} = \frac{a}{x^n}\frac{\partial}{\partial x}\left(x^n \frac{\partial u}{\partial x}\right) + uf(u^2 - w^2) + wg(u^2 - w^2),$$
$$\frac{\partial^2 w}{\partial t^2} = \frac{a}{x^n}\frac{\partial}{\partial x}\left(x^n \frac{\partial w}{\partial x}\right) + wf(u^2 - w^2) + ug(u^2 - w^2).$$

1°. Solution:

$$u = r(x)\cosh\big[\theta(x) + C_1 t + C_2\big], \qquad w = r(x)\sinh\big[\theta(x) + C_1 t + C_2\big],$$

where C_1 and C_2 are arbitrary constants, and the functions $r = r(x)$ and $\theta(x)$ are determined by the system of ordinary differential equations

$$ar''_{xx} + ar(\theta'_x)^2 + \frac{an}{x}r'_x - C_1^2 r + rf(r^2) = 0,$$
$$ar\theta''_{xx} + 2ar'_x\theta'_x + \frac{an}{x}r\theta'_x + rg(r^2) = 0.$$

2°. For $n = 0$, there is an exact solution of the form

$$u = r(z)\cosh\big[\theta(z) + C_1 t + C_2\big], \qquad w = r(z)\sinh\big[\theta(z) + C_1 t + C_2\big], \qquad z = kx - \lambda t.$$

